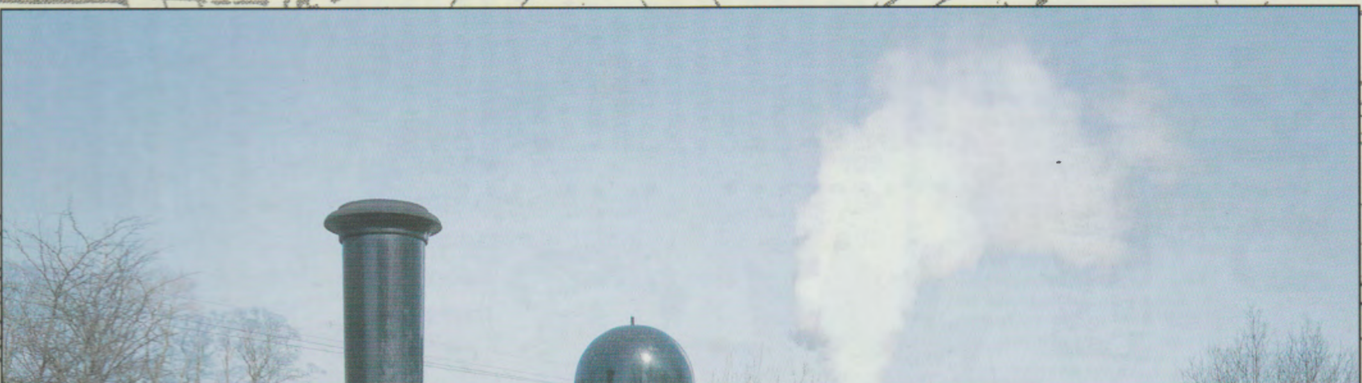
OCTOBER 1997

£1.95

ENGINEERING in MINIATURE

for **Model Engineers** worldwide



Inside:

REULEAUX'S TRAPEZIUM CONNECTING ROD ENGINE

LNWR 0-6-2T 'COAL TANK' LOCOMOTIVE IN 5" GAUGE

CHESTER U.K. LTD

THE ORIGINAL CHESTER MULTI-PURPOSE MACHINE LATHE/MILL/DRILL

SPECIAL OFFER
Model 'B' Long Bed
£999.00 inc v.a.t and delivery
Also including Fixed and
Travelling Steadies, Change Gears
and Pillar Toolpost

£775.00 Model B shown

Why a Chester Multi-purpose machine?

- A massive 420mm (16½") swing over bed
- 14 speeds for milling and drilling and 7 speeds for the lathe spindle
- Magnetic NVR stop/start forward/reverse switch fitted as standard on all models
- Door interlock switch fitted inside the belt cabinet
- Standardised Morse Taper No.3 in headstock, tailstock & milling/drilling head
- Toolpost guard and lathe chuck fitted as standard
- Choice of bed length 410mm (16") or 510mm (21¾") between centres
- Strong rigid construction for good stability
- Optional electronic variable speed system incorporating instant DC braking, no-stop reverse facility, pre-set ramp-up/ramp-down and torque control for high power at low rpm
- Complete set of standard accessories supplied at no extra cost, enabling the user to start machining immediately
- Indexing Dials marked in gradations of 0.05mm/0.002"
- More imperial and metric screw cutting possibilities than any other machine of its type
- Acme thread leadscrew for longer durability
- Optional fully welded heavy duty stand for safety and rigidity
- Over 40 optional accessories available including dividing table, tapping heads, steady rests, work mounting block, tilting table, rear splash guard, milling cutter holders and many more …
- A full back-up service for supply of spare parts, 12 month guarantee and users' telephone advice service

Machines supplied complete with:
3-Jaw Chuck, 4-Way Indexing Toolpost, Machine Vice, Set of 5 Carbide Tipped Lathe Tools, 2 Dead Centres, Milling Drawbar, Drill Chuck and Stock, Magnetic Switchgear, Door Interlock Switch, Belts, Allen Keys, 3/4 H.P. Cap: Start - Cap: Run Motor.

5 MODELS

Lathe only	**£600.00**
Lathe only L/Bed	**£650.00**
Model A	**£725.00**
Model B	**£775.00**
Model B L/Bed	**£825.00**

All prices plus V.A.T.

Send for catalogue to:
Chester U.K. Ltd,
Waverton Business Park,
Waverton, Chester CH3 7PD
Tel: 01244 336100   Fax: 01244 336036

ENGINEERING in MINIATURE

VOLUME 19 No. 4 OCTOBER 1997

IN THIS ISSUE

Editorial 97

The Robey No. 4 Light Traction Engine 98

Reuleaux's Trapezium Connecting Rod Engine 102

Constructing a Year-Going Longcase Clock 104

The Kerr Stuart Wren Class 0-4-0 Locomotive in 16mm 108

A New Track for the South Durham Society of Model Engineers 109

A Pipe Bending Tool 110

The Sheldon Compound Steam Engine 112

A Three Ton Double Acting Steam Hammer 116

LNER 20 ton Brake Van 119

LNWR 0-6-2T 'Coal Tank' in 5" gauge 120

Steam in Aylesbury Vale 122

The Early Development of the Steam Engine 125

Readers' Letters, Hints & Tips 126

Club Newsround 127

Diary of Events 128

COVER PICTURE

No. 1054, an LNWR 0-6-2T 'Coal Tank' locomotive similar to that currently being serialised within *Engineering in Miniature*, stands outside Oxenhope Station on the Keighley and Worth Valley Railway, West Yorkshire, in April 1995. Photograph by Jim Winkley.

IN NEXT MONTH'S ISSUE

Building a Freelance Mill Engine

Timber, Bricks & Clay – Steam About the House

A Three Ton Double Acting Steam Hammer

The Robey No. 4 Light Traction Engine

Constructing a Year-Going Longcase Clock

Managing Editor
C. L. Deith

Technical Editor
Norman Smedley

Associate Editor / Production
William Tranter

Advertising Manager
Adrian Deith

Published by
TEE Publishing
The Fosse, Fosse Way,
Radford Semele, Leamington Spa,
Warwickshire CV31 1XN, England
Tel: 01926 614101 Fax: 01926 614293

Produced and Printed by
Nuffield Press Ltd., 21 Nuffield Way, Ashville
Trading Estate, Abingdon, Oxon OX14 1RL
Tel: 01235 554422 Fax: 01235 535445

News Trade Sales by
USM Distribution Ltd.,
86 Newman Street,
London W1P 3LD
Tel: 0171 396 8000 Fax: 0171 396 8002

The Editor is pleased to consider contributions for publication in *Engineering in Miniature*. Manuscripts should be typed if possible (although handwritten material is of course welcomed) and should be accompanied by photographs and/or drawings. Care should be taken to pack manuscripts securely to avoid folding of photographs, etc in post. It is assumed that copyright of material submitted belongs to the contributor or that necessary clearances have been obtained. Whilst every care is taken, no responsibility can be accepted for unsolicited manuscripts, artwork, etc.

Annual Subscription
United Kingdom Standard £23.40
Comprehensive (inc. Binder) £28.90
Europe (Air Mail only) £30.60
Overseas (Accelerated Surface Post) –
Canada & USA £30.60
Rest of World £33.00
Direct Air Mail £44.90

© Publishers & Contributors
All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the Publishers. This periodical is sold subject to the following conditions; that it shall not without the written consent of the publishers be lent, resold, hired out, or otherwise disposed of by way of trade at a price in excess of the special recommended maximum price, and that it shall not be lent, resold, hired out, or otherwise disposed of in mutilated condition, or in any unauthorised cover by way of trade, or affixed to as part of any publication or advertising, literary or pictorial whatsoever.

Engineering in Miniature (ISSN 0955 7644) is published monthly by TEE Publishing, c/o Mercury Airfreight International Ltd., 2323 E-F Randolph Avenue, Avenel, N.J. 07001. Subscription price is $48 per annum. Periodicals postage paid at Rahway N.J. Postmaster send address corrections to *Engineering in Miniature* c/o Mercury Airfreight International Ltd., 2323 E-F Randolph Avenue, Avenel, N.J. 07001 (US Mailing Agent).

ARRAND

INDEXABLE TIP CARBIDE TOOLS
SETTING THE STANDARD FOR MODEL ENGINEERS

TURNING, BORING OR MILLING – ONE TIP SIZE FOR ALL TOOLS, ONE CARBIDE GRADE FOR ALL MATERIALS

LATHE TOOLS: 8mm, 10mm, 12mm & 16mm SHANKS – MILLING CUTTERS: 2MT, 3MT & R8 SHANKS

- One tip size and grade covers turning, boring, chamfering and milling.
- Our A1 grade of carbide, fitted as standard, will machine all materials - cast iron, brass, bronze, aluminium, stainless steel, steel, wood and plastic.
- Tips are specially made by one of the world leaders in carbide technology.
- All tools are supplied ready to use, complete with tips and screws for each seat and a key. They are packed in a permanent plastic storage box.
- A technical instruction sheet is supplied free with each tool, giving hints and tips as well as easy to follow feeds and speeds. It will be helpful to those new to carbides, as well as the more experienced user.
- Triangular tip is cost effective; giving 3 cutting edges compared to 2 on rhombic tips offered by other suppliers.
- Worn out tips from turning or milling can be used for chamfering.
- No grinding or sharpening is required, therefore there is no need for expensive diamond wheels.
- Three types of lathe tool are available. 91° Turning for maching up to a shoulder (it will also take light facing cuts), 45° Facing (will also turn, take light back facing cuts and chamfer) and Boring (which will also take light cuts at the bottom of a bore).
- Milling cutters available in Ø16mm, Ø25mm, Ø40mm & Ø60mm to machine a face and 90° shoulder.

Arrand standard prices are still the best value, remember they include a tip for each seat

SEND C4 SAE OR PHONE FOR OUR FREE CATALOGUE AND SEE HOW COMPETITIVELY PRICED THESE TOOLS ARE

ARRAND, The Forge, Knossington, Nr. Oakham, Leicestershire, LE15 8LN.
Tel/Fax 01664 454566

PHOENIX PRECISION

CHERRY PAINTS

Why are we advertising Cherry Paints?
Simple. We've just bought the business.
AND we intend expanding the range!
So all those who regularly use Cherry Paints can now benefit from the same strict quality control, and computer controlled production as Precision Paints users.

Trade enquiries welcome

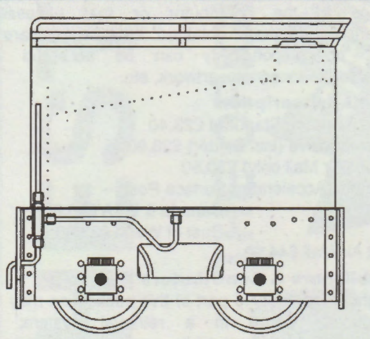
Send S.A.E. and 50p (stamps accepted) for a copy of both catalogues to:

Phoenix Precision Paints Co.
P.O.Box 359, CHELTENHAM, Glos. GL52 3YN

Come and see us on stands 28 and 29 at the MIDLANDS MODEL ENGINEERING EXHIBITION
18-25 October
Castle Donnington Exhibition Centre,
Nr Derby

SWEET PEA TENDER

14" Long – 4 wheels, water and coal carrying capabilities • Ideal for injector fitted locos



Drawings	£6.40
Frame Steel	£8.65
Buffer Beam Steel	£6.31
Buffer Angle	£5.58
Axleboxes (CI)	£8.58
Axle Material	£3.10
Horn Material	£1.45
Springs	£6.24
Wheels	£29.52
Tender Tank Brass (inc. Fixing Angles)	£59.78
Complete Set of Castings and Materials to Make Chassis	£83.29

All the above prices are subject to postage and VAT.

Save postage – place your orders for collection at the following show:

MIDLANDS MODEL ENGINEERING EXHIBITION

SEE US ON STANDS 69 & 70

Castle Donington, near Derby, 18th–25th October 1997

Catalogue £1.00 post paid, £2.00 overseas (surface) for our extensive range of ME requirements.

BLACKGATES ENGINEERING

207/209 Wakefield Road, Drighlington,
Bradford BD11 1EB West Yorkshire.
TEL: Leeds (0113) 285 3652. FAX: (0113) 285 3477

G.L.R. BUDGET PACKS

SAVE 15% WHEN YOU BUY OUR BUDGET PACKS OF MATERIALS 2 FEET EACH OF SIZES QUOTED BELOW.
PRICES QUOTED HAVE BEEN REDUCED BY 15% FROM CATALOGUE PRICE

POST AND PACKING CHARGES

NOT OVER	RATE	NOT OVER	RATE
1 KILO UP TO	£3.50	8 KILOS	£6.25
2 KILOS	£4.50	10 KILOS	£6.50
4 KILOS	£5.25	30 KILOS	£6.95
6 KILOS	£5.75	30 KILOS	MAXIMUM

CREDIT CARDS WELCOME - NO SURCHARGE
PARCELS REQUIRING A WOODEN BOX HAVE AN ADDITIONAL CHARGE OF £2.50

BRIGHT MILD STEEL FLATS		
(AO)	1/16 x 1/4 x, 3/8, 1/2, 5/8, 3/4, 1, 2, 3, 3/32 x 3/8, 1/2, 3/4, 1.	2.50 Kilos £7.15
(A1)	1/8 x 1/4, 3/8, 1/2, 5/8, 3/4, 1.	1.50 Kilos £4.96
(A2)	3/16 x 3/8, 1/2, 5/8, 3/4, 7/8, 1.	2.50 Kilos £6.07
(A3)	1/4 x 3/8, 1/2, 5/8, 3/4, 7/8, 1.	3.50 Kilos £8.44
(A4)	5/16 x 1/2, 3/4, 1, 1½.	3.50 Kilos £10.28
(A5)	3/8 x 1/2, 3/4, 1, 1½.	4.50 Kilos £10.22
(A7)	1/2 x 3/4, 1, 1¼, 1½.	700 Kilos £16.37
BRIGHT MILD STEEL ROUNDS		
(B1)	1/8, 5/32, 3/16, 7/32, 1/4, 5/16, 3/8.	1.00 Kilos £3.20
(B2)	1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8.	3.50 Kilos £7.40
(B3)	5/8, 3/4, 7/8, 1.	7.00 Kilos £12.40
(B4)	PREC. GD. 1/8, 5/32, 3/16, 1/4, 5/16, 5/8, 3/4, 1/2.	3.60 Kilos £14.15
(B5)	EN8M 3/8, 1/2, 5/8, 3/4, 7/8, 1.	8.00 Kilos £16.40
BRIGHT MILD STEEL HEXAGONS		
(C1)	5/32, 3/16, 7/32, 1/4, 9/32, 5/16, 3/8.	1.50 Kilos £3.62
(C2)	1/4, 9/32, 5/16, 3/8, 7/16, 1/2, 5/8.	4.00 Kilos £7.99
BRIGHT MILD STEEL SQUARES		
(D1)	1/8, 3/16, 1/4, 5/16, 3/8.	1.50 Kilos £3.25
(D2)	7/16, 1/2, 5/8, 3/4.	4.50 Kilos £7.59
BRASS ROUNDS		
(E1)	1/8, 3/16, 1/4, 5/16, 3/8, 1/2.	2.00 Kilos £10.57
(E2)	1/16, 3/32, 5/32, 7/32, 9/32, 7/16, 9/16, 5/8.	3.00 Kilos £15.95
BRASS SQUARES		
(F1)	1/8, 3/16, 1/4, 5/16, 3/8.	1.50 Kilos £8.95
(F2)	1/4, 5/16, 3/8, 7/16, 1/2.	3.00 Kilos £18.30
BRASS HEXAGONS		
(G1)	1/8, 5/32, 3/16, 7/32, 1/4, 9/32, 5/16.	1.50 Kilos £7.65
(G2)	1/4, 9/32, 5/16, 3/8, 7/16, 1/2, 5/8.	4.00 Kilos £20.57
BRASS ANGLE		
(H1)	1/4 x 1/4 x 1/16 - 5/16 x 5/16 x 1/16. 3/8 x 3/8 x 1/16 - 1/2 x 1/2 x 1/16.	0.60 Kilos £7.30
(H2)	5/16 x 5/16 x 1/16 - 3/8 x 3/8 x 1/16 1/2 x 1/2 x 1/8 - 3/4 x 3/4 x 1/8.	1.50 Kilos £13.43
BRIGHT DRAWN STEEL ANGLES		
(H3)	12mm x 12mm x 3mm - 20mm x 20mm x 3mm 25mm x 25mm x 3mm.	2.00 Kilos £9.94
COPPER TUBE		
(J1)	1/16, 3/32, 1/8, 5/32.	0.30 Kilos £4.04
(J2)	3/16, 1/4, 5/16.	0.50 Kilos £4.50
STAINLESS STEEL ROUNDS 303		
(K1)	1/16, 3/32, 1/8, 5/32, 3/16, 7/32, 1/4.	0.60 Kilos £8.34
(K2)	3/16, 7/32, 1/4, 5/16, 3/8, 7/16, 1/2.	3.00 Kilos £15.98
BA STAINLESS STEEL HEXAGON 303		
(L1)	.152 - 8BA .193 - 6BA .220 - 5BA .248 - 4BA .281 - 3BA .324 - 2BA	1.50 Kilos £13.22
BA BRASS HEXAGON		
(M1)	.152 - 8BA .193 - 6BA .220 - 5BA .248 - 4BA .281 - 3BA .324 - 2BA	1.50 Kilos £8.34
BA STEEL HEXAGON		
(M2)	.152 - 8BA .193 - 6BA .220 - 5BA .248 - 4BA .281 - 3BA .324 - 2BA	1.40 Kilos £3.57
BRASS FLATS		
(N1)	1/16 x 1/4, 3/8, 1/2, 3/4, 1.	1.00 Kilos £7.95
(N3)	1/8 x 1/4, 3/8, 1/2, 3/4, 1.	1.50 Kilos £13.95
(N4)	3/16 x 1/4, 3/8, 1/2, 3/4, 1.	2.00 Kilos £19.55
(N5)	1/4 x 3/8, 1/2, 3/4, 1.	2.50 Kilos £22.98
ALUMINIUM ROUNDS FC1 FREE CUTTING		
(P1)	3/16, 1/4, 5/16, 3/8, 7/16, 1/2.	0.70 Kilos £8.87
(P2)	5/8, 3/4, 1.	2.00 Kilos £15.25
ROUND PHOSPHOR BRONZE DRAWN STOCK		
(Q1)	1/8, 5/32, 3/16, 1/4.	0.50 Kilos £8.27
(Q2)	5/16, 3/8, 7/16.	1.25 Kilos £21.13

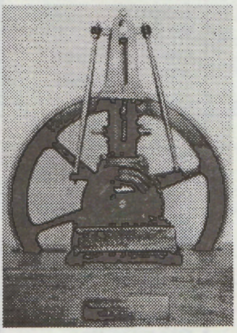
Send four first class stamps for our comprehensive catalogue & price list

G.L.R. DISTRIBUTORS LTD.

Unit C1, Geddings Road, Hoddesdon, EN11 0NT. E-MAIL: glrdists@aol.com
Tel: (01992) 470098 Fax: (01992) 468700 Open all week and Saturday morning. Callers welcome.

PLEASE NOTE - WEIGHTS QUOTED ABOVE ARE APPROXIMATED & SHOULD BE ADDED TOGETHER FOR USE AS A GUIDE FOR POST AND PACKING CHARGE.

BRUCE ENGINEERING
for
STATIONARY STEAM



The Trapezium Engine

TRAPEZIUM CONNECTING ROD ENGINE

FROM THE FINEST COLLECTION OF EARLY STEAM ENGINES DESIGNED BY *ANTHONY MOUNT*

This example of a trapezium engine is attributed to Professor Reuleaux and was taken from a Dutch text book published in the 1890s. As can be seen, the connecting rod is in the form of a trapezium and completely encompasses the cylinder. The motion is most interesting and makes for a fascinating model.

The casting set comprises: aluminium castings for the base and curved side brackets, gunmetal castings for the flywheel, cylinder, covers, steam chest and eccentric. There are 20 A4 drawings in the set with English and metric dimensions. Construction is straightforward and can be done on a Myford series 7 lathe. A mill, though not essential, would make some operations easier. Gunmetal is used for the flywheel as the quality of cast iron available is unreliable. As the flywheel is painted black, this should not detract from the finish of the model.

Price including VAT and Insured UK Delivery, £103

Tel. 01932 245529 ***Fax 01932 226738***

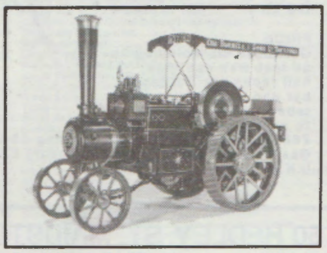
Bruce Eng. catalogue £1.75 UK, $5 rest of world

BRUCE ENGINEERING,
Hollow Tree, Riverside, Shepperton,
Middlesex TW17 8NF
World wide mail order available

VISA MasterCard

MJ ENGINEERING

Burrell Tractor
2" Scale
Complete Set of Drawings
Compound Cylinder (16 sheets) £71.35
Single Cylinder (17 sheets) £75.52
Builders Manual £19.00
Price inc. P&P and VAT



◄ **Send for our illustrated catalogue £1.50**

M.J. ENGINEERING
Manor Hatch, 63b Southampton Rd,
Ringwood, Hampshire BH24 1HE
Telephone 01425 476234

TRACTION ENGINE *specialists*

LIVE STEAM MODELS

announce
the purchase of

MODEL ENGINEERS SUPPLIES

Burton Joyce, Nottingham
(the late Peter Evans)

Comprehensive range of Model Engineering materials, rivets, screws, bolts and boiler fittings.

Catalogue available with full range of traction engines and model engineering supplies.

Callers welcome or send £3.00 for catalogue to:

LIVE STEAM MODELS LTD
Unit 7, Old Hall Mills, Little Eaton,
Derby DE21 5DN
Tel. 01332 830811
Fax: 01332 830050

WARCO

See us at the **MIDLANDS MODEL ENGINEERING EXHIBITION**
18-25 October 1997
Castle Donington
nr Derby

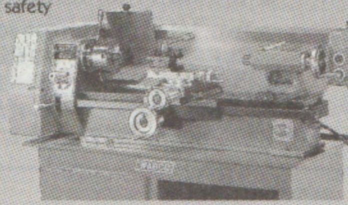
QUALITY MACHINE TOOLS FOR THE MODEL ENGINEER

918 LATHE **Amazing value only £899 including VAT**

Warco include all these accessories without any additional cost. 3 Jaw Chuck with reversible jaws. 4 Jaw Chuck. Face Plate. Fixed Steady. Travelling Steady. 4 Way Indexing Tool Post. Norton Quick Change Thread Cutting Gearbox for Imp/Met Threading. Dead Centres. Maintenance Tool Kit.

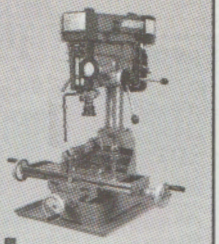
SPECIFICATION
- Centre Height 4½"
- Distance between centres 18"
- Spindle Bore ¾" 3MT
- ¾ 1 Phase Motor. Forward/Reverse Switch
- Hardened and ground bedways
- Individual Accuracy Test Report supplied
- Available as metric or imperial machine

220 PRECISION
MODEL ENGINEER LATHE **£1499 including VAT**
- 8⅝" swing 20" between centres
- ¾" H.P. motor with NVR safety switchgear
- Hardened and ground precision bedway
- Covered leadscrew. Acme thread
- DIN standard accuracy test report



MINOR MILL DRILL
- 18½" table traverse increased from 14½"
- 1" increased on throat depth - now 8½"
- Finely ground slideways superb finish. Previously scraped by hand
- Two longitudinal oil grooves on table to prevent coolant overflow
- Heavier gauge belt cover
- Improved depth stop

£829 including VAT



WMT 300
Lathe/Mill Combination **Only £949 including VAT**
- WMT300 Lathe/Mill Combinations
- 6" Centre height x 20" between centres
- 1" Spindle Bore
- Imp/Met Threading

HUGE RANGE OF ACCESSORIES AT NO EXTRA COST:
5" 3 Jaw chuck - 4 way tool-post - Dead centres - Fixed steady - Travelling steady - Drill chuck + Arbor - Tipped face cutter - Mill drill vice - Set TCT tipped Lathe tools - All supplied without any additional charge.

A huge range of model engineer machine tools and accessories.

WARCO

VISA

WARCO, Fisher Lane, Chiddingfold, Surrey GU8 4TD
Tel: 01428-682929
Fax: 01428-685870

PHONE FOR THE LATEST BROCHURE

4 Q D
30 Reach Road
Burwell
Cambridge
CB5 0AH
01638 741 930

Battery Motor Speed controllers

Current limit MOSFETs chopping at 20kHz for efficiency.
Regenerative braking. Excellent low speed torque and control.
Give control of 0-100% full speed.

Applications include: Model railways. Kiddie cars
Mobility aids. Golf trolleys. Electric cycles. Caravan shifters
Carnival floats. Floor cleaners. Automatic guided vehicles.

Currents up to 300 amps. voltages 12v to 36v.
Prices start at £30. Discounts for quantity.

4QD series: High current, reversing. Full featured. *For golf buggies & high performance.*
NCC series: Reversing. Currents up to 100 amps. *For mobility aids. locos. kiddiecars etc.*
2QD series: Non reversing. Ecomony range *For general purpose speed control.*
1QD series: Non reversing. No braking. *For golf caddies etc.*

EMD motors also available.

Satisfaction guaranteed. British design and manufacture
Technical advice available.

Please send SAE for details.

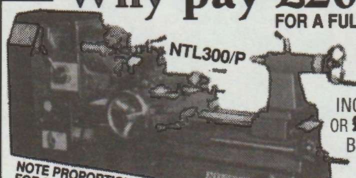
CLERKENWELL
SCREWS LTD

SUPPLIERS TO THE MODEL and HOROLOGICAL INDUSTRIES

PRECISION TURNED SCREWS and PARTS

Two 1st class stamps for Lists to:
CLERKENWELL SCREWS LTD.
109 Clerkenwell Road, London EC1R 5BY
Telephone: 0171 405 6504
Fax: 0171 831 3057

Why pay £2000 or more



FOR A FULL SCREWCUTTING & POWER FEEDING LATHE WITH FAR LESS CAPACITY. THIS MACHINE CAN BE YOURS FOR only £695 total
INCLUDING ALL STANDARD EQUIPMENT OR **£825** TOTAL FOR A LATHE/MILL COMBINATION BOTH FULLY GUARANTEED, VAT PAID & DELIVERED FREE. ANYWHERE U.K. MAINLAND

NOTE PROPORTIONAL CENTRE HEIGHT FOR RIGIDITY-ALSO ON OUR LATHE/MILL

AT LAST A SENSIBLE LOW COST BUY. FOR LIGHT INDUSTRY, GENERAL HOBBIES, MODELMAKING, ETC. IT'S ROBUST, PRECISION BUILT & CAPABLE OF A VERY WIDE RANGE OF WORK.

SEND S.A.E. FOR FULL INFORMATION & ADDITIONAL SUPER SPECIAL OFFERS OR PHONE FOR FREE TECHNICAL ADVICE & GUIDANCE (OUR PLEASURE) IF NEEDED.
P.M.T. Established at Cuckfield since 1972

Just look at these spec. details:

CENTRE HEIGHT-6". BET. CENTRES-20". HEADSTOCK SPINDLE BORE-1"+. 4 WAY TOOL POST. TEE SLOTTED TABLE-8"x6". 5" 3 JAW CHUCK & REV. JAWS. METRIC THREADS-14 (05-3mm). IMPERIAL THREADS-20 (11-40 t.p.i.). OVERALL SIZE-36"x17"x16" HIGH. WEIGHT-2cwt. 1 PHASE 240V MOTOR. REVERSE SWITCHING AND SO MANY GREAT ADVANTAGES, AS CAN BE SEEN DEMONSTRATED, UNDER POWER, IN OUR SHOWROOMS.

Visiting by appointment please

PAISLEY MACHINE TOOLS
SPARKS LANE, BROOK STREET, CUCKFIELD, SUSSEX RH17 5JP
Tel. (01444) 413122 or
(01444) 242266 anytime

"Gauge 1" LOCOSTEAM "0 Gauge"

We specialise in Gauge "1" live steam – see our present catalogue No. B4. price £1.50 postage paid (£2.00 overseas).

Basic material kits for over 20 locos, including The Project, Kaye, V2, H2, Princess and Black 5. 47 sizes of shell moulded wheel castings. Viton "0" rings. Butane valves. axle driven pumps. NEW screw link couplings, handrail knobs, pressure gauges, etc. Plus all the usual materials. Copper, brass, bronze, BMS, stainless steel, track materials, silver solder, springs, rivets and small tools.

We also specialise in **lost wax castings**, bronze and brass, with a number of detailing items now available. X heads, horn guides, vac ejectors, clacks etc.

There are 4 "0" Gauge designs available with more to come.

LocoSteam Model Engineers (Tel: 01692 630683)
"Wyndwood", King Street, Neatishead, Norwich NR12 8BW

MAIDSTONE ENGINEERING SERVICES (SALES)

CATALOGUE 4 1st. class stamps
PROMPT MAIL ORDER

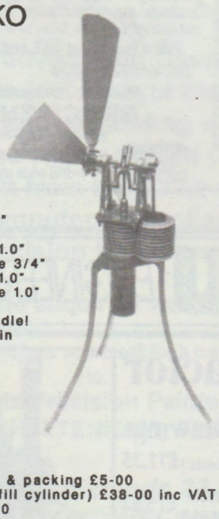
1/2 Scale KY-KO
HOT AIR FAN

Description.
Fans of tis type were much used up until the thirtys to provide general cooling. they were normally powered by a small oil lamp.

Model specification.
Overall height 15.1/2"
Fan diameter 11.0"
Power cylinder Bore 1.0"
Stroke 3/4"
Displacer cylinder Bore 1.0"
Stroke 1.0"

Power source
Gas,Spirit burner or candle! (these are not supplied in the kit.)

PRICE
Complete kit including all lost wax castings, ball races,pre-machined hot cap and displacer tube and all hardware to complete.
£88-00 inc.VAT U.K.post & packing £5-00
Gas burner(excluding refill cylinder) £38-00 inc VAT
U.K.post & packing £2-00

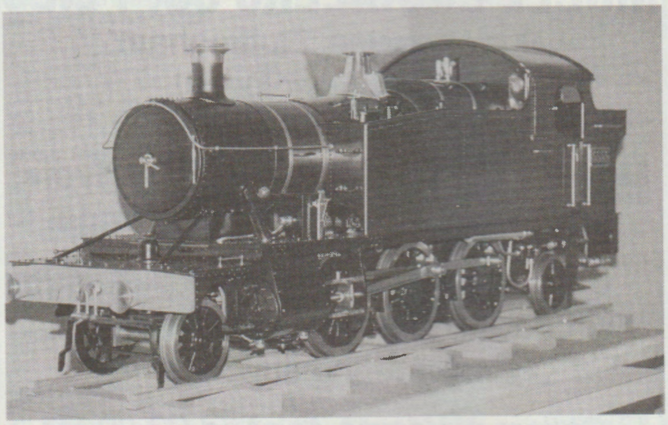


B.M.S.
Brass
Phos.Bronze
Copper
S/Steel
Gauge Plate
Silver Steel
C.I. Bar
P.T.F.E.
Nylon
Stainless tube
Screws & Nuts
Studding
Rivets
Rivet Snaps
Drills
Reamers
Slot Drills
End Mills
Taps & Dies
Silver Solder
Flux
'O' Rings
Gauge Glass
Graphite Yarn
Jointing
Steam Oil
Cutting Oils
Castings
Fittings
Books
Drawings
Hand Tools
Transfers

50 HEDLEY ST, MAIDSTONE , KENT, ME14 5AD
Tel : (01622) 691308 Fax : (01622) 687216
Shop open Mon. to Sat.

'FIREFLY'

5" gauge GWR 2-6-2 locomotive designed by Martin Evans



Built to the highest standard (new but track-tested).
More detailed photographs available.
Price £4,500.00 delivered UK.
For further information, please contact Angus Walker on
++27 21 852 4464 (South Africa)
or you can communicate with him via
Mr Stephenson in the UK on
Tel. no. (01376) 320374 or
Fax no. (01376) 553178

G & M TOOLS

CURRENT USED STOCK LIST

LATHES

NEW Emco Compact 5 CNC Lathe Mark 4, 1ph, 6 Tool Turret	£2650.00
Emco Compact 5 CNC, 6 Tool Turret, 1ph, VGC, Mark 4	£2225.00
Emco Compact 5 CNC, 6 Tool Turret, 1ph, VGC, Upgraded to Mark 4	£2000.00
Myford Super 7B, Stand, Tooling, Green, Immaculate, 1ph	£3250.00
Maximat V10 Lathe, Milling Head, Tooling, 3ph	£1200.00
Emcomat V8 Lathe, 3ph with phase converter fitted, vgc	£650.00
Emcomat 7 Lathe and Tooling	£600.00
Emco Unimat 4 Lathe	£410.00
Boxford AUD 4.1/2" x 18", Very Well Tooled, 1ph,	£1000.00
Boxford BUD 4.1/2" x 24", Very Well Tooled, 1phase, GC, Choice	£1000.00
Boxford AUD 5" x 22", Well Tooled, Very Good Condition, 3ph	£1600.00
Boxford BUD 5" x 22", Well Tooled, VGC, Choice of 2, 3ph	£1400.00
Colchester Bantam 1600, 5"x20" Lathe, 3ph	£1250.00
Colchester Student Round Head 6"x 25", Tooling, Choice	£1100.00
Harrison M300 Centre Lathe, 6" x 40", 3ph, Gap Bed, Choice of 3	£3000.00
Harrison M300 Centre lathe, 6" x 30", 3ph, Gap Bed, QCTP, Tooled.	£3500.00
Harrison M250 Centre Lathe, 5" x 25", 3ph, Tooling, VGC	£3500.00
Harrison 140 Lathe, Gearbox, Tooling, Gap Bed, TTA, Single Phase	£1850.00
Harrison L5A 11" Centre Lathe, Tooling, Norton Box, 3ph	£1250.00
Harrison L5 9" x 25" Lathe, Well Tooled, Single Phase	£1100.00
Harrison L5 9"x 25" Lathe & Tooling, VGC	£950.00
Raglan Variable Speed Lathe, 3ph	£750.00
Littlejohn Raglan Variable Speed Lathe, 5" x 20", Tooled, 1ph	£650.00
Smart & Brown Model M Lathe & Tooling, 1ph	£750.00
Smart & Brown Model L Plain Lathe, 3ph	£500.00
CVA 10"x30" Toolroom Lathe, Tooled	£1000.00
Wolf Jahn Watch/Clockmakers Bench Lathe, Countershaft, Collets, V.Slide, Chucks etc, 1ph	£1250.00
Hunger VKDR1 Valve Facing Lathe, Bench Mounting, Box, 1ph, VGC	£350.00
Viceroy Dual Wood/Metal Lathe, Chuck, Bowl Turning, Stand, 3ph	£650.00

DRILLING MACHINES

Viceroy 2MT Spindle Drilling Machine, 3ph, VGC	£350.00
Boxford Union Floor Standing Pillar Drill, 5 speed, 3ph	£250.00
Elliott Progress No 1 Pillar Drill, 3ph	£200.00
Fobco Star Pillar Drill, 3ph, Choice of 3, Excellent Condition	£375.00
Pinnacle Pillar Drill, 2MT, Rack Op.Table, 4 speed, 1ph	£250.00
Oldack High Speed Bench Drill, 0 - 1/4" Cap., 3ph	£150.00
Delta Radial Drill Press (unused)	£150.00
Meddings 1/2" Cap. Pillar Drill, Light, 3ph	£275.00
Meddings 1/2" Cap. Bench Drill, 3ph	£175.00
Startrite Mercury Bench Drill, fitted speed reducer, 3ph	£250.00
Hauser Instrument Makers Drilling Machine for restoration,	£50.00
Niigata Type 10ST Vibrating Tapping Machine	£500.00
Superior Tapping Machine 5/8" Cap. (large, old)	£250.00
Pollard 1MT Pillar Drill, 3ph	£200.00

MILLING MACHINES

NEW Emco F1 CNC Milling Machine, 1ph, NEW	£3500.00
Bridgeport Turret Mill, Power Feed, 3ph	£2000.00
Beaver Turret Mill, 3ph, Long Table With Power Feed, 30 Int, Old	£1000.00
Arboga Vertical Mill, Swivel head, Vice, 3 MT , 3ph, VGC, Manual	£1200.00
Boxford VM30 Vertical Mill, 30 Int Spindle, 3ph, Immaculate	£1600.00
Harrison Vertical/Horizontal Milling Machine, Power Feed, 3ph	£1650.00
Tom Senior M1 Horizontal/Vertical, VGC, 3ph, Choice of 2	£1250.00
Tom Senior M1 Horizontal Mill, 3ph	£500.00
Warco RF30 Major Mill/Drill, Vice, 1ph	£950.00
Pools Horizontal Mill, Old, 1ph	£250.00
Omega No.1 Jig Borer with Tooling, DRO, Nelsa Guards	£1500.00
BCA Jig Borer, 1ph, tooled	£850.00
Scripta Engraver, 3ph, Type, Manual, Excellent Condition	£1500.00
Taylor Hobson Model K Engraver, 1ph, VGC,	£1750.00
Bench Die Filer, VGC, Single Phase	£200.00

POWER HACKSAWS

Startrite 24-S-5 Bandsaw, Single Phase, Excellent Condition	£1500.00
Startrite 14-S-5 Bandsaw, 3ph	£1000.00
Thiel Segurd 117 V/S Metal Cutting Bandsaw, fitted Welder	£1200.00
Rapidor 6" Power Hacksaw, 3ph	£250.00
Warco Power Hacksaw, 1ph	£350.00
Rex 6" Power Hacksaw, 3ph	£350.00
Qualters and Smith 6" Power Hacksaw, 3ph, Choice of 3	£350.00
Qualters and Smith 8" Power Hacksaw	£500.00
Qualters and Smith B6W Horizontal Bandsaw, 3ph	£550.00
Kingsley 6" Power Hacksaw, 3 ph	£275.00
SIP 9" Metal Cut Off Saw, Coolant, Vice, 1HP, 1 Phase, NEW	£385.00
SIP 9" x 16" Horizontal Band Saw, 1ph, 4 Speed, (List £2650)	£1950.00
SIP 7" x 12" Horizontal Band Saw, 1ph, 4 Speed, (List £890)	£625.00
Mec 225 Bench Circular Cut Off saw, Swivels, Coolant, NEW, 1ph	£385.00
Export Brown Automatic Cold Saw, 3ph	£1000.00

GRINDERS, LINISHERS, POLISHERS

Capco Surface Grinder, 18" x 6", Mag Chuck, 3ph	£650.00
Eagle Surface Grinder, 18" x 6" Cap., Mag Chuck, 3ph, Choice	£750.00
Dormer Model 53 Tool & Cutter Grinder, well tooled	£1250.00
Boxford Union Tool and Cutter Grinder, Cabinet, Tooling, 3 ph	£800.00
Wolf 6" Bench Grinder (3ph)	£50.00
Union Jubilee 10" Pedestal Grinder, 3ph	£125.00
Viceroy Double Ended Buffer, 3ph	£250.00
Viceroy Double Ended Buffer, 3 ph, 1HP	£300.00
RJH Bison Buffer/Grinder, 3ph	£225.00

SHAPERS

Bartsch Hydraulic Shaper, 180mm stroke	£350.00
Elliott 10M Shaper, 3ph, Very Good Choice	£300.00
Elliott 14" Shaper, 3ph	£450.00
Invicta 14" Shaper, 3ph	£450.00
Alba 1A Shaper, Vice, 3ph	£250.00
Boxford 8" Shaper with Vice, 3ph	£400.00
17"x13" Tilting Table for Elliott Shaper	£100.00
Brook 14" Shaper, 3ph	£450.00

BOXFORD SPARES & TOOLING.

Change Gears(Also fit Southbends).
16T-£10, 18T-£11, 20T-£11, 21T-£11, 22T-£11, 23T-£11, 24T-£11, 26T-£11, 27T-£11, 28T-£11, 30T-£12, 31T-£12, 32T-£12, 35T-£12, 36T-£12, 37T-£12, 38T-£14, 40T-£14, 41T-£14, 43T-£14, 44T-£14, 45T-£14, 46T-£14, 48T-£14, 50T-£15, 52T-£15, 53T-£15, 54T-£15, 56T-£15, 59T-£15, 60T-£15, 64T-£15, 71T-£18, 75T-£18, 79T-£18, 80T-£20, 88T-£22, 100T-£25, 127T-£30.

100/127T Compound Gear	£55.00
127/135T Compound Gear	£65.00
54/18T Compound Gear	£30.00
72/18T Compound Gear	£35.00
32T Tumbler Reverse Gear	£12.00
5" Catchplate	£15.00
6" Backplate	£20.00
4" Backplate	£18.00
Boxford Faceplates	£38.00
Pratt Burnerd 4" 4 Jaw Chuck	£75.00
Boxford 6" Pratt Burnerd 4 Jaw Chuck	£85.00
Boxford Imperial or Metric Cross Slide Nuts (New)	£38.00
Boxford Imperial or Metric Cross Slide Screws (New)	£88.00
Boxford Lathe Cabinets, Suitable for Many Bench Lathes	£100.00
Collet Drawbar, Adaptor & Nose Cap	£85.00
Boxford Apron & Saddle Assembly with Power Crossfeed	£200.00
Boxford Saddle Limit Switch Kit	£40.00
New Brook Crompton 1 phase 240 volt electric motor	£150.00
Danfoss Contactor & Overload Switch for above	£32.00
Headstock Saddle & Apron parts available	POA
Boxford 3-2MT Headstock Sleeve	£ 8.00
4.1/2" or 5" Tailstock	£125.00
Boxford Change Gear Cover	£40.00
Boxford Change Gear Quadrant	£15.00
Boxford Topslide Assy	£45.00

MYFORD SPARES AND TOOLING.

Change Gears:
20T-£4.00, 21T-£4.00, 25T-£5.00, 30T-£5.00, 35T-£5.00, 38T-£6.00, 40T-£6.00, 45T-£6.00, 50T-£7.00, 55T-£7.00, 60T-£9.00, 65T-£9.00, 70T-£9.00, 75T-£10.00, 80T-£12.00, 100T-£14.00, 127T-16.00

Myford (Toolmex) Quick Change Toolpost (4 holders) New	£125.00
Myford Fixed Steady	£40.00
Myford Travelling Steady	£25.00
Myford Super 7 Half Nuts (pair)	£15.00
Myford Super 7 Leadscrew	£30.00
Myford 4.1/2" Catchplate	£15.00
Myford Lever Operated Collet Chuck & 8 Collets	£250.00
Myford 1133C 16mm Arbor	£25.00
Myford Multi Stop (for use with capstan att.)	£85.00

HARRISON SPARES AND TOOLING.

L5 and L6 gears 20T, 25T,	£10.00
28T, 32T, 34T, 35T, 36T, 38T	£15.00
42T, 43T, 44T, 45T, 46T, 48T	£20.00
40T, 50T, 55T, 56T,	£25.00
60T, 63T, 64T, 65T, 66T, 69T	£30.00
70T, 72T, 75T, 76T, 77T	£35.00
80T, 81T, 84T, 86T, 90T, 94T	£40.00
100T, 100T Nylon, 108T, 115T, 120T, 120T Nylon	£45.00
126T, 130T	£50.00
127T	£60.00
9" Faceplate	£35.00
15" Faceplate	£65.00
18" Faceplate	£75.00
6" Catchplate	£20.00
5" and 6" 2.1/4"x6TPI Backplates	£15.00
6" 1 1/2" x 6 TPI Backplate	£22.00
7.1/2", 2.1/4"x6TPI Backplates	£20.00
L5/L15 micrometer carriage stop	£50.00
L15 4 position indexing carriage stop	£75.00
L5/L6 travelling steady, complete	£30.00
Saddle apron cross slide and tailstock handwheels	each £15.00
Gear charts, name plates and badges,	from £ 3.00
Harrison L15 travelling steady	£55.00
Harrison L5 Fixed Steady	£65.00
Harrison L5 Gap Piece	£50.00
Harrison L5 Cross-slide Nut (Imperial or Metric)	£40.00
L5 1.3/8" bore headstock sleeves	£20.00
L5 10" 4 jaw ind chuck (2.1/4"x6TPI)	£100.00
L5A Topslide Assembly	£75.00
L5 saddle assembly	£125.00
6" L5 backplate 1.1/2"x6TPI	£20.00
Harrison Dividing Head Division Plates,	each £15.00
Harrison M400 Capstan Attachment, unused	£500.00
Harrison M400 Saddle Drilling Attachment, unused	£150.00

COLCHESTER SPARES AND TOOLING

Colchester Triumph 2000 Travelling Steady	£75.00
Colchester Triumph 2000 7" Catchplate	£30.00
Colchester Triumph 2000 Headstock Sleeve	£35.00
Colchester Triumph 2000 S\C Gearbox Casing + a few parts	£150.00
Colchester Bantam\Chipmaster Tailstock	£125.00
Colchester Student 1800 Fixed Steady	£150.00
Colchester Student 1800 Roundhead Headstock Sleeve	£20.00
Colchester Student 1800 Rack (new)	£75.00
Colchester Student 1800 Screwcutting Gearbox	£225.00
Colchester Student 1800 Headstock Internal Gears	POA
Colchester Student Roundhead Gap Piece	£50.00
Colchester Student Roundhead Rack	£25.00
Colchester Student Roundhead Thread Dial Indicator	£35.00
Colchester Student Roundhead American Toolpost	£20.00
Colchester Student Roundhead Headstock sleeve	£25.00
Colchester Student Roundhead Change Gears (Various Sizes)	each £15.00
Colchester Student Roundhead Travelling Steady	£30.00
Colchester Master 2500/Student 1800 12" 4 Jaw Chuck	£150.00
Colchester Triumph Roundhead 14" Faceplate	£75.00
Colchester Triumph Roundhead 12" 4 Jaw Chuck	£100.00
Colchester Triumph Roundhead Tailstock	£150.00
Colchester Mascot Roundhead 20" Faceplate	£100.00
Colchester Mascot Roundhead 12" 4 Jaw Chuck	£100.00
Colchester Mascot Roundhead 10" Catchplate	£30.00

MACHINE ACCESSORIES

OMT 16" Horizontal/Vertical Rotary table	£500.00
OMT 10" Optical Rotary Table, VGC	£200.00
OMT 12" Inclinable Rotary Table	£350.00
Vertex Horizontal/Vertical 6" Rotary Table (New)	£135.00
Vertex Horizontal/Vertical 8" Rotary Table (New)	£250.00
Vertex Horizontal/Vertical 10" Rotary Table (New)	£300.00
Vertex Horizontal/Vertical 12" Rotary Table (New)	£350.00
Hofmann 8" Rotary Table, VGC	£275.00
Elliott 15" Rotary Table	£250.00
Bessboro SWR2 325mm Swivel & Tilt Rotary Table	£350.00
Taylor Hobson Inclinable 6" Rotary Table	£225.00
Abwood 8" Swivel and Tilt Rotating Table	£250.00
Elliott U1/U2 Rack Dividing Attachment	£150.00
Apex 4" Swivel & Tilt Machine Vice (as new)	£150.00
Jones and Shipman Unigrip Drill Vice, VGC	£45.00
Abwood 6" Swivel & Tilt Vice	£250.00
Spencer Franklin 150mm Power Lock S/C machine vice, vgc	£200.00
Apex 4" Universal Vice (as new)	£150.00
Marlco Indexer and 7 collets (1.3/4" Cap.)	£250.00
Carl Zeiss 130mm Optical Dividing Head and tailstock	£450.00
Thiel/Ruhla Dividing Head	£300.00
BSO Dividing Head	£250.00
Cooke Troughton and Simms Optical Inspection Dividing Head	£500.00
Hofmann 5" Dividing Head & Tailstock	£400.00
Swivel Vertical Milling Head (Large), 4MT	£150.00
Elliott Sturdimill 1250 Slotting Head	£350.00
Monks & Crane SL1 Cutter Grinding Attachment	£75.00
Thoka Arbo No.2 2MT 6 Station Turrett Drill Attachment	£250.00
30 INT Stub Arbors to Take Shell End Mills, Good Range	£30.00
Clarkson 30 INT FC3 Cutter Holder	£25.00
Osborn Titanic 3 MT Milling Chuck, 4 Imp Collets	£85.00
Albrecht 1/2" Keyless Chuck Thiel Taper	£50.00
Sandvik R8 Shell End Mill Holder	£45.00
R8 Str Shank Cutter Holders, 1/8", 1/4", 3/8", 1/2", 1", 5/8"	each £22.00
3MT Dormer Milling Chuck to fit Arboga Drill	£75.00
Osborn Titanic R8 Milling Chuck & 4 Collets	£85.00
Clarkson 30INT C Type Autolock Chuck, 4 Imp Collets	£65.00
Clarkson 30 INT Autolock Chuck (small) with 4 collets	£85.00
Clarkson 40 INT C Type Autolock Chuck (large) 2 Imp Collets	£65.00
Clarkson 40 INT Autolock Chuck (large) with 2 collets	£100.00
Clarkson 40 INT Autolock Chuck (small) with 4 collets	£80.00
Clarkson 40 INT Dedlock 200 chuck	£50.00
Clarkson 40 INT FC3 Holder	£25.00
Clarkson Large/Small Adaptor & 4 collets	£100.00
Alfil 45 INT Collet Chuck(unused)4 small metric collets	£75.00
Clarkson 50 INT Autolock chuck (lge) 2 imp collets	£100.00
Clarkson 50 INT Autolock chuck (small) 4 imp collets	£85.00
Clarkson 50 INT Dedlock 200 chuck	£85.00
Clarkson 50 INT FC3 holder	£45.00
Titanic 50 INT milling chuck and 4 small collets, imp	£75.00
Bristol Erickson Acramill 50INT collet chuck - large	£125.00
Clarkson 4MT Dedlock 150 Chuck	£75.00
Osborne Titanic 4MT Chuck (lrge) 2 Imp collets	£85.00
Clarkson 3MT C Type Autolock Chuck (lrg) 2 imp collets	£75.00
Clarkson 4 MT Autolock chuck (lge) 2 imp collets	£80.00
Clarkson 5 MT Autolock chuck (small) 4 met. collets	£80.00
Clarkson C Type Collet Chuck, (Large) 2 collets, Thiel Taper	£85.00
Set of 15 Thiel Collets, 1/8"-1"	
Clarkson Autolock Chuck Collets Large	each £15.00
Clarkson Autolock Chuck Collets, Small, Imp,	each £15.00.Metric £20.00
Modeloy 3MT Light Duty Milling Chuck, 3 Imp Collets	£65.00
Mikron 52mm Headstock collets	each £25.00
40 INT-1 & 2 MT adaptors	each £25.00
Toolmex 40INT 20" Milling Arbor (Boxed, Unused)	£125.00
J & S 40INT x 12" Horizontal Milling Arbor, 1" Diameter	£100.00
50 INT-2, 3, 4 MT, 40INT adaptor	each £30.00
50 INT horizontal milling arbor	£50.00
R8-3MT and R8-2MT Adaptors	£22.00
Thiel Taper -2MT Adaptor	£30.00
Precise 56 Piece Spacing Collar Set, 1.1/4" Bore	£125.00
Precise 60 Piece Spacing Collar Set, 1.1/4" Bore	£125.00
Lushington 40INT Boring and Facing Head	£250.00
Lushington No2 Precision Offset Boring Head, 4 MT Shank	£65.00
A B Creed 4 MT Boring Head	£150.00
Super 40 INT Boring and Facing Head	£250.00
Garnet Boring and Facing Head, 30 INT Shank (Removable)	£250.00
J and S Hatch R8 Boring Head, Box	£125.00
Wohlhaupter UPA2 Boring & Facing Head, 2MT	£350.00
Wohlhaupter UPA3 (Newall Jig Borer Taper)	£375.00
Wohlhaupter UPA3 Boring & Facing Head, 9 B&S Shank	£375.00
Wohlhaupter UPA4 Boring & Facing Head (Fits Dixi Jig Borer)	£450.00
Wohlhaupter UPA5 Boring & Facing Head, 5MT Shank	£600.00
UBS GR Boring and Facing Head, 4MT Shank, Boxed, Accesories, VGC	£250.00
Newall 4MT Boring & Facing Head, Very Well Equipped, VGC	£400.00
Huron Precision Boring and Offset Boring Head, 40INT, Cased	£225.00
Armag 4MT Boring & Facing Head for irregular bores	£300.00
Bridgeport No 2 Boring Head, R8 Shank	£125.00
Lockwood 2MT Micro boring head (new)	£75.00
3MT Poliangular Attachment	£175.00
Criterion K3, 4MT, 1" Capacity Reversible Tapping Head, VGC	£275.00
Archer No.2 2MT Tapping Head	£175.00
Marlco Adjustable Pitch Circle Drilling Fixture,	£250.00
Slack & Parr Type A36/2 3 spindle Drill Head	£200.00
Ackworthie-Goliath 4 spindle drill attachment, 1MT	£100.00
Coventry Type CH 1/2" Die Head	£75.00
Coventry Type CH 1" Die Head	£75.00
Coventry Type CH 1.1/2" Die Head	£100.00
Coventry Type CHS 1.1/2" Die Head	£150.00
Herbert Chaser Grinding Attachment, 1 1/2" Diehead Chasers	£150.00
Herbert Chaser Grinding Attachment, 1.1/4" Diehead Chasers	£125.00
Herbert Chaser Grinding Attachment, 1" Diehead Chasers	£100.00
Set of 4 Woden Straight Lathe Carriers, 1/2"-1.1/4"	£15.00
Set of 6 Jones & Shipman Straight Lathe Carriers, 1/2"-2"	£25.00
Jones & Shipman Tap Relieving & Sharpening Att., VGC	£400.00
Jones & Shipman Radius Dresser	£150.00
Joyco Radius Grinding Wheel Dressing Attachment	£125.00
SMP Floating Chuck (30mm Shank)	£85.00
Pratt No257 8" Steel 4 Jaw Ind.Chuck, D15 Camlock, Boxed, unused	£175.00
Pratt No.193S 12" Steel 4 Jaw Independent Chuck, Boxed, Unused	£200.00
Pratt 12" 4 jaw chuck L2 fitting	£150.00
Toolmex 12" 3 Jaw Chuck, Backplate Mounting	£200.00
Burnerd Multisize Collet Type M2, 3, 6	each £20.00
Burnerd Multisize Collet Type MB8, 10, 11	each £25.00
Union Mafg.Co 6" Independent self centering 3 jaw chuck	£75.00
Jaws for P/B 6 Jaw Chuck, fit 250mm chuck, Pt No 2658-26884	£75.00
Burnerd 548BLK Soft Jaws (fit 10 1/2"-12" 3 jaw chuck)	£25.00
Burnerd 308BLK Soft Jaws (fit 4" 3 jaw Chuck)	£20.00
Toolmex 160mm 3 Jaw Chuck (Unused)	£125.00
SCA 250mm 3 jaw chuck, D8 camlock	£125.00
Old 3 Jaw Chuck suitable for Dividing Heads, Fixtures etc. 1 set of Jaws only 4", 5" or 6"	£25.00
7" Crawford Trugrip Collet Chuck c/w 30 collets 3/16"-2" cap	£500.00
Herbert No.4 Quick Change Drill Chuck & Holders	£100.00
Jacobs 30 0-5/16" Drill Chuck, 2JT Mount, Boxed, Unused	£12.00
Jacobs 32 0-3/8" Drill Chuck, 2JT Mount, Boxed, Unused	£12.00
Hardinge Turrett Tool Presetting Fixture	£650.00
Aciera F4 Horizontal Overarm	£200.00
Aciera F4 Differential Indexing Gearbox & Gears	£450.00
Thiel 1/2"x8" Horizontal Milling Arbor 3MT (unused)	£65.00
Thiel 5/8"x8" Horizontal Milling Arbor 3MT (unused)	£70.00
Thiel 3/4"x10" Horizontal Milling Arbor 3MT (unused)	£75.00
Thiel 3/4"x8" Horizontal Milling Arbor, Thiel Taper (Unused)	£85.00
Thiel Collets (11 Assorted) Large Thiel Taper	£200.00
Thiel Stub Arbor 1/2" or 5/8" (unused)	£35.00
Thiel Collets (small) Various sizes	each £15.00
Smart and Brown Step and Ring Collets(Models A & M)	each £25.00
Disc Chucks for Boley Lathe, 15mm Dia. Shank	each £25.00
Schaublin 102 Screwcutting Attachment (unused)	£750.00
8 x Schaublin F16 Collets	£75.00
8 x Schaublin F20 Collets	£85.00
6 x Schaublin F22 Collets	£75.00
Schaublin W20, W25 Collets	each £10.00, £12.00
Pultra 8mm Collets . 3 for	£25 each £10.00
Pultra 8mm Disc Collets	each £15.00
Pultra 10mm Collets	each £15.00
Pultra Vertical Slide	£160.00
5C Disc Collets (various diameters)	each £15.00
1MT, 2MT, or 3MT tailstock die holder (new)	£30.00
3 MT horizontal milling arbor (new)	£75.00
3-2 MT open ended ejecting adaptor (new)	£15.00
3 MT stub arbor (new)	£30.00
40INT Stub Arbor (1.1/2" dia), unused	£35.00
3-4MT Extension Sleeve	£25.00
4-6MT Extension Sleeve	£50.00
Jones & Shipman 6MT Rotating Tube Centre	£100.00
1MT, 2MT or 3MT revolving centre (new)	£20.00
Mandrin Universal Floating Reamer Holder, 4MT Shank, 2MT socket	£85.00
4MT lathe centre (unused)	£ 8.00
5MT lathe centre (unused)	£10.00
6MT Fixed Centre (Unused)	£25.00
Viceroy 5" Catchplate	£15.00
Viceroy Change Gears, Various sizes available	POA
Viceroy Topslide	£65.00
Raglan Gears, 32T-£10, 36T-£10, 42T-£12, 44T-£12, 45T-£12, 48T-£12, 52T-£14, 60T-£14	
Raglan 6" 4 Jaw Chuck	£100.00
Raglan Lever Operated Cut off Slide	£150.00
Raglan 6" Backplate	£22.00
Southbend Tailstock	£75.00
Dividing Head Tailstocks, 5" & 7" available	each £30.00
Tailstock for Marlco Indexing Fixture 5" C/H	£150.00
J & S Type 2341 104 Double Ended Boring Bar	£15.00
Lushington LBK-161 3/8"-1" Cap. Capstan Knurling Tool 1.1/2" Shank	£150.00
Miller Type STRO, 1" Shank Quick Knurl	£125.00
Two Wheel Clamp Type knurling Tool (Marlco Type) NEW	£45.00
Tripan Size 111 Quick Change Toolpost and 6 Holders	£200.00
Burnerd TP2 Patent Toolpost set	£125.00
Deckel 40INT Horizontal Arbor	£75.00
R8 Horizontal Arbor, 1"	£60.00
Quantity of 2" Arbor Spacers	£30.00
Taylor Hobson Engraver Type Tables	each £65.00
Qty. of Tooling for Ward Tool & Cutter Grinder	£350.00
Copies of Machine Manuals, Many Available	S A E For List
130 Bound Volumes of Model Engineer, 1895-1964 inc.VGC	POA

WORKSHOP EQUIPMENT

3' x 2' Surface Table	£250.00
2` x 2` Surface Table	£150.00
Crown Grade B 3` x 3` Surface Table, VGC	£350.00
12" x 8" or 10" x 8" Surface Plate	£40.00
12" x 12" Surface Plate	£45.00
18" x 18" Surface Plate	£65.00
Crown Windley 9" x 7" Black Granite Surface Plate, VGC	£75.00
Crown Composine 8"x12" T-slotted Compound Sine Table	£325.00
Jones and Shipman 12" x 12" Co-ordinate Table, VGC	£300.00
P.V.E. No.2 Co-ordinate Table 12" x 13"	£350.00
5" x 5 1/4" Micrometer Adjustable Co-Ordinate Table	£150.00
Pair Windley Bros 15" x 18" x 24" Hand Scraped box Cubes	£300.00
9"x7"x6" T-slotted Box Cube	£65.00
12"x10"x9" T-slotted Box Cube	£75.00
12" x 12" x 24" Cast Iron Webbed Angle Plate, Hand Scraped	£150.00
Windley 6"x6"x6" Webbed Angle Plate	£45.00
8"x6"x5" Webbed Angle Plate	£50.00
10"x8"x6" Webbed Angle Plate	£75.00
12"x9"x8" Webbed Angle Plate	£100.00
6"x5"x4.1/2" Angle Plate	£25.00
20" x 15" x 15" Swivel Angle Plate	£150.00
180mm x 130mm Adjustable Angle Plate	£165.00
250mm x 178mm Adjustable Angle Plate	£225.00
M&W Metric Radius Gauge(New)	£ 7.00
Presto BSW Rethreading files (New)	£ 5.00
Number Drill Gauges 1-60	£ 5.00
General 255M Screw Pitch Gauge 9-40TPI	£ 7.00
Craftsman 9-4030 Screw Pitch Gauge 4-84TPI	£10.00
M&W Metric Wire Gauge, New	£ 6.00
Eclipse Junior Hacksaw Blades (Box of 100)	£ 8.00
17 off Eclipse 21" Machine Hacksaw Blades, 6TPI	LOT £75.00
20 off 600mm x 4TPI Speedicut Machine Hacksaw Blades	LOT £75.00
Essex Tool & Gauge Co. 10" Sine Bar	£30.00
Matrix 250mm Sine Bar	£40.00
Mercer type 95011-451 Clock Stand	£35.00
Mitutoyo 3046E Metric Dial Gauge	£30.00
Essex 4"x20" Sine Bench Centres	£300.00
J & S 4"x24" Bench Centres	£200.00
Crown Composine 12" x 8" Sine Table	£200.00
22" X 8" Sine table	£150.00
Polish 10" x 1.1/4" Sine Bar (Boxed, Unused)	£40.00
Zivy 10, 000 rpm Tachometer (Swiss)	£75.00
Rabone 18" Engineers Spirit Level	£85.00
Watts 18" Block Level, 1 Div=0.0005" in 10"	£325.00
Hilger and Watts 12" B.S.S Type 2 Level, 1 Division=0.1mm/M	£200.00
Wyler (Swiss) 300mm Precision Level, 1 Div=0.0002"/10", As New	£275.00
Watts Precision 8" Square Block Level, 1 Div=0005"per 10", Cased	£225.00
M&W Spring Dividers 3", 4", 6"	£3.00 £4.00, £5.00
M&W Spring Calipers 3", 6"	£3.00, £5.00
M&W Spring Inside Calipers 3", 6",	£3.00, £5.00
Taylor Hobson 12.1/2" Television Projection Lens	£150.00
Windley Bros Tunnel Type Demagnetiser, 415 Volt	£150.00
Eclipse No 913 Pair of Magnetic Floaters	£25.00
Pair Eclipse No.823 Swivelling Brackets	£100.00
Pair 10" Vee Blocks	£75.00
Pair Toolmex Vee Blocks 90x70x125mm and Clamps, unused	£100.00
Pair Toolmex Vee Blocks 63x45x70mm and clamps, Unused	£65.00
Eclipse Minor 5"x2 1/2" Magnetic Chuck, Box, VGC	£100.00
Eclipse 7" x 4" Magnetic Chuck	£100.00
Fimax 10"x6" Magnetic Chuck	£125.00
Walker Hagou 10"x6" Magnetic Chuck, Immaculate, As New	£250.00
Eclipse 14"x6" Magnetic Chuck	£150.00
Eclipse 18"x6" Magnetic Chuck	£165.00
Eclipse 18"x8" Magnetic Chuck	£175.00
PVE 8"x2" & 2"x2" Precision Rollers	Pair £25.00
Transwave 5HP Capacity Phase Converter (new)	£350.00
Transwave 3HP Capacity Phase Converter (new)	£280.00
Edwards Rotoburr Deburrer/Edge Beveller, Bench Mounted, 3ph	£200.00
Spare Circular Tables for imported Pillar/Bench Drills,	from £35.00
2MT Drill Quill for Imported Drill	£15.00
33"x10"x6" Ammunition Boxes	each £5.00
Eclipse Type AX90 Circular 9" Magnetic Chuck	£100.00
Pair Eclipse No 925 Magnetic V Block Holders, vgc	£175.00
Eclipse Type No A818 Adaptor Plate, 14 1/2" x 6" x 1", Boxed	£100.00
Eclipse Type No A146 Adaptor Plate, 11" x 4 1/4" x 1", Boxed	£75.00
Eclipse Type DA Demagnetiser, 240v	£50.00
24" x 8" Magnetic Chuck	£175.00
6MT Test Mandrel	£25.00
9 Jarno Taper Test Mandrel	£25.00
1 Morse Taper Test Mandrel	£30.00
Avery/Rockwell Hardness Test Block	£10.00
Large Quantity of Silversmiths, Tinsmiths Stakes etc	S A E For List
Blacksmiths Leg Vice on Tripod Stand	£75.00
Blacksmiths Leg Vice	£25.00
Blacksmiths Anvil and Stand	£150.00
Blacksmiths 12" x 12" Swage Block and Stand	£125.00
Bicksmiths 20" x 20" Swage Block and Stand	£175.00
Kasenit Gas Forge/Brazing Hearth	£200.00
H M E Tilting Crucible Furnace, LPG, VGC	£250.00
Flamefast CRM600 Rapidmelt Crucible Furnace,	£325.00
Flamefast DS120F Combined Brazing Hearth and Forge, 3ph	£175.00
Alcosa Forge/Brazing Hearth, Extractor Hood Unit, Twin Fan, Wall Mounting, 1ph	£150.00
Cytringan 300 Amp Oil Cooled Arc Welder, 3ph	£250.00
Alldays and Onions Coke Forge, Blower, Water Cooled,	£350.00
Neilson 6A Deep Throat Flypress	£300.00
Gabro BF620-2 Box/Pan Folder, 24" x 18G, Excellent Condition	£600.00
Edwards Trufold 4` x 14g Box and Pan Folder	£1400.00
Edwards 6` Box and Pan Folder	£1500.00
Schechtl 5` Metal Guillotine, Hand Operated, Backgauge etc, VGC	£1000.00
Imetex Type GG2 Fine Sheet Metal Guillotine, Max 28swg x 9"	£250.00
Hunton RA 12 Bench Punch Press	£150.00
Scot Goliath 6" Bench lever Shear, 5/32" Cap., VGC	£60.00
Tirfor T7 Winch c/w 10 m wire rope, test certificate, etc.VGC	£200.00
Smart & Brown H5 Toggle Press	£165.00
Parvalux Geared Right Angle Drive Motor 220/250 V, 1ph, output 454rpm, New, Unused, Boxed	£25.00
Fracmo 180 Volt DC Motor, 0.85 Amps, 3000 rpm, 1 ph, Boxed	£20.00
Prior Automatic Numbering Stamp (Fits in Fly Press)	£100.00
Electric Potters Wheel, 1phase	£250.00
Set Marlco Broaches (Round 7/32" - 1")	£175.00
Three Marlco Broaches, 3/8", 1/2", 5/8"	£100.00
Mini C/STD Portable Pneumatic Bevelling Machine	£225.00
Send S A E for our Stock List on Used Woodworking Equipment	

MEASURING EQUIPMENT

M&W 0-1", 1"-2", 2"-3" Micrometers	each £20.00
M&W 3"-4", 4"-5", 5"-6" Micrometers	each £25.00
M&W 6"-7", 7"-8", 8"-9" Micrometers	each £30.00
M&W 9"-10" Mic	£35.00
M&W 10"-11" Mic	£40.00
M&W 11"-12" Mic	£45.00
M&W 15"-16" Mic	£60.00
M&W 17"-18" Mic	£65.00
M&W 18"-19" Mic	£65.00
M&W 19"-20" Mic	£70.00
M&W 21"-22" Mic	£80.00
M&W 22"-23" Mic	£85.00
M&W 23"-24" Mic	£90.00
Micrometer Standards - Various Sizes 6"-26"	each £15-£25.00
Mitutoyo 0-25mm Micrometer	£20.00
Brown & Sharpe Thread Micrometer, 8-13, 14-20, 22-30 TPI	each £10.00
Tesa 75 - 100mm Direct Reading Micrometer	£35.00
M&W 0 -4" Adjustable Micrometer	£50.00
M&W 8"-12" Adjustable Micrometer	£100.00
Starrett 500-600mm Adjustable Micrometer	£200.00
M&W 0-1/2" Micrometer Heads, Boxed, Unused	each £10.00
M&W 0-1" Micrometer Head (Large dia. Thimble)	each £25.00
M&W 0-25mm Micrometer Head (Large dia. Thimble)	each £25.00
Mitutoyo 103-927 0-75mm Micrometer Set, Boxed Unussed	£100.00
M&W 50-75mm Micrometer	£30.00
Etalon 75-100mm or 100-125mm Micrometer	£30.00
Starrett 225-250mm Micrometer	£45.00
M&W 250-275mm Micrometer	£50.00
Starrett 275-300mm Micrometer	£50.00
Starrett 250mm-275mm Mic	£45.00
M&W 275mm-300mm Mic	£50.00
M&W 200mm-300mm Adjustable Micrometer	£100.00
M&W 0-1" Micrometer 6" deep throat	£40.00
M&W 0-25mm Micrometer 6" deep throat	£40.00
M&W 75-100mm Micrometer 6" deep throat	£45.00
M&W 0-1" Micrometer, 4" Deep Throat	£35.00
M&W 3/4"-1.3/4" Sheet or Plate Mic (wide anvils)	£25.00
Mitutoyo 0-25mm Hub Micrometer	£25.00
Mitutoyo 129/132 0-6" Depth Micrometer	£35.00
Mitutoyo 0 - 3" Depth Micrometer	£32.00
M&W 0-3" Depth Micrometer	£30.00
M&W 0-6" Depth Micrometer	£35.00
M&W 0-12" Depth Micrometer	£60.00
Shardlow 0-25mm Depth Micrometer	£20.00
M&W 0-300mm Depth Micrometer	£60.00
Brown and Sharp 0 - 3" Depth Micrometer	£30.00
Shardlow 2" - 9" Inside Micrometer	£35.00
M&W 2"-12" Internal Micrometer	£40.00
M&W 8"-23" Internal Micrometer	£40.00
M&W 8"-33" Internal Micrometer	£50.00
Starrett 50-200mm Internal Micrometer	£40.00
Starrett 50-310mm Internal Micrometer	£50.00
Shardlow 50-300mm Internal Micrometer	£50.00
M&W 50mm - 210mm Internal Micrometer	£45.00
M&W 200-570mm Internal Micrometer	£50.00
M&W 200-825mm Internal Micrometer	£60.00
Starrett 200-800mm Internal Micrometer	£65.00
Set6 of 6 Mitutoyo 3 point Bore Mics 40-100mm (no setting rings)	£550.00
Moore and Wright 2"-3" x 6" Throat Micrometer, boxed, vgc	£35.00
M&W Instrument Maker's Micrometer, boxed, vgc, revolving anvil	£100.00
Set of 7 CEJ Thread Micrometers, Whit.8-40 TPI	£125.00
Mitutoyo Digimatic Indicator No.575-203 1DU-1025E	£75.00
Mitutoyo 156-101 Micrometer Stand	£25.00
Browne and Sharp 4" Toolmakers Square	£40.00
Wallace Rubber Hardness Meter and Test Blocks	£50.00
Set of 9 Angle Gauges for Shadow Protractor Testing	£100.00
Matrix Combination Angle Gauge Set	£350.00
Acru 12" Master Square	£75.00
M&W No.400 4" Precision Square	£10.00
Rank Taylor Hobson Clinometer	£125.00
Somet Bevel Protractor	£70.00
Somet Dial Gauge Metric 0-01mm (40mm dia)	£20.00
Somet Lever Type D61 Dial Test Indicator (metric)	£30.00
Metric Dial Gauge, Boxed	£15.00
Mitutoyo 3058E Large Dial Indicator, VGC	£50.00
Boxed set of 16 Hoffman Precision Rollers 3/16"-1.1/4"	£40.00
Matrix Gauge Block Accessory Set (VGC)	£150.00
M&W 9" Scribing Block	£20.00
M&W 18" Scribing Block	£25.00
32" Scribing Block	£35.00
JFA Micrometer Adjustable Scribing Block, 500mm	£60.00
JFA Micrometer Adjustable Scribing Block, 900mm	£75.00
24" Height Transfer Stand	£25.00
18" D.T.I. Stand	£25.00
Verdict 12" Height Transfer Stand	£25.00
500mm Adjustable Gauge Stand	£30.00
Heavy Duty Dial Gauge Stand with Dial Gauge	£35.00
Matrix Level Comparator	£250.00
Sigma Comparator	£75.00
FWP Adjustable Comparator Stand with 0.0005 Comparator	£75.00
Comparator Stand with Dial Gauge	£30.00
Mercer Heavy Duty Comparator Stand	£50.00
Eclipse 101 9" Surface Gauge	£20.00
SIP MU 100A Measuring Machine	£450.00
Pitter Screw Pitch Measuring Machine	£200.00
Pratt & Whitney 48" Length Measuring Machine	£250.00
Watts Circular Division Tester	£250.00
Watts Microptic Measuring Machine	£150.00
Watts Angle Gauge Level	£100.00
Mahr No.24 Centri-meter	£150.00
Matrix Hob, Worm or Gear Profile Recorder, Boxed, Immaculate	£300.00
Mitutoyo DT10 Digimatic Data Transmitter c/w 8 off DL-10 Digimatic Data Loggers	£1000.00
C.Zeiss Universal Measuring Microscope & Tooling	£1750.00
Vickers M10 Microscope	£150.00
Tayloy Hobson Toolmakers Microscope, well equipped, choice of 3,	£500 £750
Nikon Binocular Microscope	£150.00
Hauser P219 Profile Measuring Microscope	£350.00
Large Quantity of Taylor Hobson Talysurf 3 equipment; Base Units Recording Heads, Probes, etc .Lot Price	£500.00
Hilger & Watts Type TA121-1-194771 Angle Decker, VGC	£400.00
Matrix/Watts Optical Projection Dividing Head, VGC	£350.00
Rubert Surface Finish Scales, Drilling & Reaming, Turning, Grinding, Milling, Linishing, Shaping	each £15.00
Matrix Pitter E28 Class 1 Slip Gauge Set	£75.00
Mitutoyo 516-508-01 M88 Slip Gauge Set, Boxed, Unused	£500.00
Mitutoyo 516-508-01 M46 Slip Gauge Set, Boxed, Unused	£275.00
Micronaid E81 Inspection Grade Slip Set	£250.00
Mitutoyo 32 Piece Metric Slip Gauge Set, Excellent	£200.00
Mitutoyo 516-806 Pair Carbide Wear Slips 1mm Grade 0	£40.00
Mitutoyo 516/101N 10 Piece Metric Slip Set	£100.00
Mitutoyo 9 piece set 1-001-1-009mm	£75.00
Matrix Pitter Metric reference Wire Set(12) 2.91-3.05	£30.00
9 Piece Tungsten Carbide Metric Slip Gauge set 1-01-109mm	£30.00
Set of 4 Lushington Small Hole Gauges, 280"-987"	£35.00
Large Selection of Telescopic Bore Gauges, Sold Singly, 1/2"-6"	POA
Good Stock of Bore Micrometers By Tesa.Bowers, Mitutoyo, Mercer	POA
British Indicators (Baty) 6" - 12" Dial Bore Gauge Set, Boxed	£150.00
Diatest Bore Gauge Set 0.057"-.830", VGC	£250.00
Mercer Dial Bore gauge set, Range 6"-12", Boxed	£145.00
Correx 500gm Spring Tension Gauge	£30.00
Chatillon 5Kg Spring Tension Gauge	£40.00
GEC Paint Thickness Gauge	£25.00
Elcometer Coating Thickness Gauge (for all non-ferrmagnetic coatings) cased, VGC	£40.00
5 x Ovee Thread Comparators (Metric)	£150.00
Set 3/16" - 1" Whit. Ovee Thread Gauges	£35.00
Chesterman 1"x2"x10" Parallels (Boxed)	£65.00
Pair Windley 12"x3"x1.1/2" Parallels	£65.00
Pair 12" x 3" x 1 1/2" Parallels	£65.00
Pair 10"x2.1/2"x1.1/4" Parallels	£50.00
Pair 25x50x250mm Parallels	£65.00
M and W Combination Square	£75.00
Coventry Gauges 8" Circular Toolmakers Flat, Cased	£85.00
Matrix 12 sided 30 Degree Polygon	£300.00
Mitutoyo 500-191U 6" Digimatic Vernier Caliper (New)	£87.50
Mitutoyo 530/115 300mm/12" Caliper, boxed, unused	£75.00
Benson 12" Vernier Caliper	£35.00
Chesterman 12" Vernier Caliper	£35.00
Etalon 12" Vernier Caliper	£40.00
Starrett 24" Vernier Caliper	£50.00
Mitutoyo 1.5m Stainless Steel Vernier Caliper, boxed, VGC	£850.00
M&W 8" Depth Vernier	£35.00
Brown & Sharp 5" Vernier Depth Gauge	£15.00
Keighley 6" Vernier Depth Gauge	£25.00
Starrett 12" Vernier depth gauge	£25.00
Benson 14" Vernier Depth Gauge	£35.00
Verdict 6" Height Micrometer + 12 " raising block	£100.00
Frenco 150mm Height Micrometer, immaculate, Boxed	£150.00
Frenco 300mm Height Micrometer + raising block (needs cleaning) 20 available	each £75.00
Somet 300mm Height Gauge	£100.00
Mitutoyo 520/155 12"/300mm Height Gauge, Boxed, Unused	£165.00
Mitutoyo 520/163 18" 450mm Height Gauge, Boxed, Unused	£315.00
Mitutoyo 520/156 24"/600mm Height Gauge, Boxed, Unused	£375.00
Mitutoyo 520/157 40"/1M Height Gauge, Boxed, Unused	£800.00
HK 500mm Height Gauge	£75.00
Grey & Rushton 36" Vernier Height Gauge (No Box)	£85.00
10"/250mm Stainless, Hardened, Vernier Height Gauge, Boxed with accesories, As New, Immaculate	£75.00
Chesterman 48" Vernier Height Gauge	£250.00
Chesterman 42" Vernier Height Gauge	£150.00
Chesterman 26" Vernier Height Gauge	£100.00
Chesterman 20" Vernier Height Gauge	£85.00
Chesterman 12" Vernier Height Gauge	£85.00
Chesterman 12" Vernier Height Gauge (Braille)	£100.00
C.A. Gray 24" Vernier Height Gauge	£100.00
Huddersfield Gauges 24" Vernier Height Gauge	£100.00
Moore & Wright No.612 6'Grade A Straight Edge	£125.00
Moore and Wright 6" Straight edge, boxed	£20.00
Moore and Wright No 315 Straight Edge Set (3) with Test bar	£60.00
24" Camel Back Straight Edge	£65.00
36" Camel Back Straight Edge	£85.00
48" Camel Back Straight Edge	£100.00
60" Camel Back Straight Edge	£100.00
72" Camel Back Straight Edge	£125.00
Pr. Brown & Sharpe No.377 Key Seat Clamps	£8.00

CUTTERS, DRILLS ETC

Horizontal S&F cutters 1" arbor 4", 5", 6"	each £5.00, £6.00 & £8.00
Qty. Galtona Inserted Tooth Cutters, 8"-10" dia., (approx.20)	£125.00
Involute Gear Cutters	each £10.00
Sandvik R262 100mm Tipped Facing Cutter	£85.00
Horizontal Cutters 1" Bore	20 for £15.00
Horizontal Cutters 1.1/4" Bore	20 for £20.00
50 Assorted Reamers up to 1"	£45.00
10 Assorted reamers 1"-2"	£35.00
4 MT Socket Reamer	£15.00
B&S No.5 Socket Reamer	£10.00
Shell End and Slab Mills, Various Sizes	from £5.00
Slab Mills 1" and 1.1/4" Bore	5 for £10.00
Pack of 5 Unused Drills, 13/32", 15/32".13mm	£5.00
Assortment of Tool Steel 20 Bits	£10.00

TELEPHONE ENQUIRIES WELCOME ON ANY ITEM OF STOCK, WE HOLD HUNDREDS OF ITEMS THAT ARE NOT LISTED.
ALL ITEMS SUBJECT TO AVAILABILITY. ALL PRICES ABOVE ARE SUBJECT TO CARRIAGE AND VAT AT 17.5%. WE DELIVER TO ALL PARTS OF THE U.K.
OVER 7000 SQUARE FEET OF TOOLS, MACHINES AND WORKSHOP EQUIPMENT. OPENING TIMES: MONDAY-SATURDAY 9 a.m. – 1 p.m. & 2 p.m.– 5 p.m.
VISA — SWITCH — ACCESS

G AND M TOOLS THE MILL MILL LANE ASHINGTON WEST SUSSEX RH20 3BX TEL: (01903) 892510 FAX: (01903) 892221

THE ONE AND ONLY

PROOPS BROTHERS LIMITED

6 PIECE WOODCARVING SET	£15.95
13 PIECE CRAFT KNIFE SET	£4.95

PYROGRAPHY KITS

SALIX (5 Tips)	£14.95

ADDIS MINIATURE WOODTURNING TOOLS
SHEFFIELD MADE HIGH SPEED STEEL
16 SHAPES - SEND FOR LIST

MARPLES ROSEWOOD AND BRASS TOOLS

3"SQUARE	£4.95
3"SLIDING BEVEL	£5.95
3"MITRE SQUARE	£5.95
3"DOVETAIL SQUARE (1 in 6 or 1 in 8)	£4.95

MAGNIFEYES
3 CLIP-IN LENSES
LIGHTWEIGHT,
ADJUSTABLE HEADBAND £9.95

EYEGLASSES

3½x, 10x, 12x, 15x each	£1.50
CLIP ON 2x, 3x, 4x each	£1.95

MAGNIFYING GLASSES (DRAPER)

SMALL	£1.95
MEDIUM	£2.95
LARGE	£3.95

GOOSENECK MAGNIFIER
2 x GLASS MAGNIFYING LENS
13" GOOSENECK ON HEAVY BASE
£9.95

MAGNIFIER/LAMP
3 x MAGNIFICATION
CLAMP OR SCREW ON
£24.95

HELPING HANDS
COMPLETE WITH GLASS MAGNIFIER £4.95

CUTTING MATS
SELF SEALING – DOUBLE SIDED

A1 (900 x 600)	£38.00	A4 (300 x 220)	£4.75
A2 (600 x 450)	£19.00	A5 (200 x 135)	£2.50
A3 (300 x 450)	£9.50		

SLIDE CUTTER AND MAT .. £9.95

ROTARY CUTTER
£3.95

MINI GUILLOTINE
£9.95

MINI MITRE BLOCK	.95
BENCH HOOK	.95
PRECISION PLIERS	£4.50
TINMENS SHEARS	£2.95
3" CALIPERS: In-Out-Divide each	.95
PLASTIC CALIPERS	£1.50
METAL CALIPERS	£2.95

VERNIER CALIPERS

METRIC 0-150	£17.95
IMPERIAL 0-6"	£17.95

MICRO DRILLS:

METRIC SIZES 0.3 - 1.6 DIA 2 for	£1.00
NUMBERED SIZES 60 - 80	£5.95
METRIC 0.3 - 1.6	£5.95
ARCHIMEDEAN DRILL	£2.95
SWIVEL END PIN VICE	£2.25
PICK-UP-TOOL – METAL	£2.95
PICK-UP-TOOL – PLASTIC	£1.50

DRILL CHUCKS

10mm 1MT or 2 MT	£12.95
13mm 2MT	£14.95
16mm 2MT	£16.95

SEND FOR OUR FREE CATALOGUE OR VISIT OUR SHOP
OPEN 8am – 5pm MON – FRI

ALL PRICES INCLUDING POSTAGE & PACKING ON ORDERS OVER £25

RATCHET DRIVER & ALLEN KEY
£3.95

SWISS FILE HANDLE

Suitable for most needle files (complete with brass collet)	£1.95
6 ASSORTED NEEDLE FILES (English)	£4.95
TUNGSTEN CARBIDE RIFFLERS (8 shapes) each	£4.95

DENTAL BURRS

20 ASSORTED	£4.95
6 ASSORTED DENTAL PROBES	£9.95
7 ASSORTED MOUNTED POINTS (mini grinders)	£1.95
6 WAX CARVERS	£9.95

SCISSORS

3", 4", 5", 6" 4 pairs	£4.95
BRASS FACED PLIERS	£3.95
TACK LIFTER	£2.45
PACK OF SPRINGS 100 ASSORTED	£2.95
PRECISION OILER 10 SIZES 0.1 to 1.2mm please specify each	£1.45

THE WALKOVER 555 OXY/PROPANE BRAZING KIT
Made in Italy, this compact set incorporates main features normally found only in larger sets:- Universal fitting regulators, hoses fitted with pressure regulators and anti blowback devices, welding quality tinted goggles.
£49.95
Refills: OXY: £3.60 GAS £3.05

MICROTORCH
PENCIL THIN, REFILLS WITH LIGHTER BUTANE
REACHES 1300°C VARIABLE FLAME £7.95

SILVER SOLDER · EASY FLO 33 or 55

1.5 ROUND	£1.70
1.5 FLAT	£1.85
FLUX – TUBE	.50
GOLD OR SILVER PLATED WIRE	£2.95
BRASS OR COPPER PLATED WIRE	£1.95

RAZOR SAWS

Sheffield made 40 tpi	£5.95
GENT SAWS 6"	£4.95
7"	£5.45
8"	£5.95
PIERCING SAW	£6.95
FRET/PIERCING SAW BLADES (German) 84 ASSORTED	£4.95

LOCKING FORCEPS

Stainless Steel 6", 7", 8"	£2.75
STAINLESS STEEL TWEEZERS 6 POINTED	£7.95
4 SELF LOCKING	£10.95
SPLINTER PICKERS Eye Glass and Tweezers	£2.95

BRASS DOMING BLOCKS

SMALL	£5.95
MEDIUM	£8.95
LARGE	£10.95

UNIVERSAL WORKHOLDER

METAL	£12.95
NYLON	£7.95

G CRAMPS (Superstrong glass filled nylon)

1"	.50
2"	.60
3"	.70
QUICK CRAMPS 50mm and 100mm	.50
MINI SASH CRAMPS 12"	£1.95
24"	£2.50

WIRE BENDER	£1.95
GRINDING WHEEL DRESSER	£3.95
SPARE WHEELS	£1.95

PAINT BRUSHES

PLASTIC HANDLES 10 for	£1.00
WOOD HANDLES – POINTED 5 for	£2.00
FLAT 5 for	£2.00

PROOPS BROTHERS LTD. 24, SADDINGTON ROAD, FLECKNEY, LEICESTER
TEL: 0116 240 3400 FAX: 0116 240 3300

BARCLAYCARD VISA

Access

AUSTRALIA & NEW ZEALAND MAIL ORDERS TO
LINIC PROOPS · PERTH. WESTERN AUSTRALIA · PHONE AND FAX: 9·240-2939

THE WORLD'S LEADING EXHIBITION DEVOTED EXCLUSIVELY TO MODEL ENGINEERING

Midlands MODEL ENGINEERING EXHIBITION '97

18 – 25 OCTOBER 1997

at **INTERNATIONAL EXHIBITION CENTRE,**
CASTLE DONINGTON, Nr DERBY (near EXIT 24, M1 Motorway)

See
- HUNDREDS OF SUPERB SCALE MODELS OF RAILWAY LOCOMOTIVES, TRACTION & STATIONARY ENGINES, ETC.
- CLUB DISPLAYS BY OVER *FORTY* SOCIETIES

The ENGINEERING in MINIATURE WORKSHOP

staffed by some of the UK's leading experts

WORKING LIVE STEAM EXHIBITION LAYOUTS

presented by **THE GAUGE 1 MODEL RAILWAY ASSOCIATION**
& THE ASSOCIATION OF 16mm NARROW GAUGE MODELLERS

Plus A WORKING MINIATURE GOODS
MARSHALLING YARD

presented by the Ground Level 5" Main Line Association

MODEL STEAM ROAD VEHICLES

See MODEL TRACTION ENGINES, STEAM WAGONS, ETC IN ACTION

All the UK's leading Suppliers will be present

- **Axminster Power Tools**
- **Beugler Pinstriping Tools**
- **Blackgates Engineering**
- **Bruce Engineering**
- **Braithwaite MT Rebuild**
- **BW Electronics**
- **Chester UK Ltd**
- **Chronos Ltd**
- **College Engineering Supply**
- **Diana Carney Locomotive Nameplates**
- **EKP Supplies**
- **Emco**
- **John Ellis (Boilers)**
- **Frhei Drills**
- **Excel Machine Tools**
- **Greenwood Tools**
- **R S Hammond & Sons**
- **Hegner UK**
- **Home & Workshop Machinery**
- **Jaymac (Derby) Ltd**
- **Kirjeng Model Engineering Services**
- **LA Services Ltd**
- **Langdon (London) Ltd**
- **Live Steam Models**
- **Myford Ltd**
- **Peatol Machine Tools**
- **Pheonix Paint Company**
- **Power Capacitors Ltd**
- **Proops Bros Ltd**
- **A J Reeves & Co (Birmingham) Ltd**
- **R D & G Tools of Haworth**
- **Rexon Ltd**
- **Rotagrip Ltd**
- **Shesto Ltd**
- **Starkie & Starkie Ltd**
- **TEE Publishing**
- **Tony Green Steam Models**
- **Toolstop (Bracknell)**
- **Tracy Tools Ltd**
- **Warren Machine Tools**
- **Winson Engineering Ltd**

PLUS OTHERS YET TO BE ANNOUNCED

OPEN:

10.30am-6.00 DAILY
(final day 5.00pm)
LATE NIGHT THURSDAY
TILL 8.00pm

ADMISSION:

ADULTS	**£6.50**
CHILDREN	**£4.00**
SENIOR CITIZENS	**£5.50**
FAMILY TICKETS (2 Adults 2 Children)	**£17.50**

Exhibition organised by
Meridienne Exhibitions Ltd, The Fosse, Fosse Way, Leamington Spa CV31 1XN. Tel: 01926 614101 Fax: 01926 614293

The Midlands MODEL ENGINEERING EXHIBITION

BY TRAIN, CAR, COACH OR PLANE IT'S EASY TO REACH THE SHOW

How to find us:

The exhibition will be held at the International Exhibition Centre, Donington Park, Castle Donington, near Derby. Donington Park lies where the three counties of Nottinghamshire, Derbyshire and Leicestershire meet, virtually in the middle of the country. It has excellent road connections, being only three miles from the major trunk routes of the M1 and M42 motorways. East Midlands International Airport is but two and a half miles away and has a comprehensive domestic and European flights schedule. The main line Intercity railway stations of Derby and Nottingham are a twenty minute drive away and are well served by public transport and taxi services. Our usual exhibition link bus service will operate from DERBY Station.

Stagecoach
MIDLAND RED

EXHIBITION LINK

Stagecoach Midland Red will be operating a special service from **DERBY** Railway Station to the International Exhibition Centre at Donington during the exhibition. The service will also run on the Sunday.

EXHIBITION LINK TIMETABLE

Daily throughout the Exhibition including Sunday

OUTWARDS:

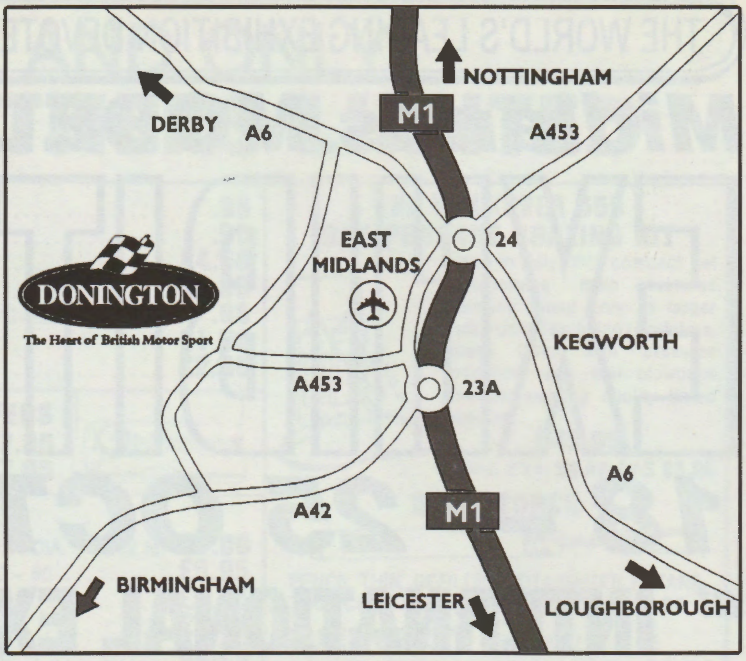
Derby Railway Station	10.10	10.50	11.30	12.10	12.50
Exhibition, Donington	10.30	11.10	11.50	12.30	13.10

RETURN:

Exhibition, Donington	14.45	15.45	16.45	17.45
Derby Railway Station	15.05	16.05	17.05	18.05

THURSDAY'S LATE NIGHT SERVICE
departs 18.45 & 19.45

Times given are approximate and may be subject to variation.
Return fare (approx.): Adults £2.80, Child/Senior Citizen £2.20.



ROUTES TO CASTLE DONINGTON:

***From the South* via M1:** Leave the M1 at junction 23A following the signs for East Midlands Airport (A453) and the brown 'tourist' signs for Donington Park. Go past the main entrance to the airport (traffic lights) and proceed for approximately 2 miles until a right turn signposted Donington Park and Castle Donington takes you on to the B6540. 300 metres along this road brings you to the main entrance of Donington Park. Follow internal signs for the Exhibition Centre.

***From the North* via M1:** Leave the M1 at junction 24 and follow the signs for East Midlands Airport (A453) and the brown 'tourist' signs for Donington Park. Go past the main entrance to the airport (traffic lights) and proceed for approximately 2 miles until a right turn signposted Donington Park and Castle Donington takes you on to the B6540. 300 metres along this road brings you to the main entrance of Donington Park. Follow internal signs for the Exhibition Centre.

***From the South West* via M5 & M40 to M42:** From the M5 join the M42 at junction 4A and from the M40 join the N42 northbound at junction 3A. Continue northbound on the M42/A42. Exit A42 at junction 14 following the signs for East Midlands Airport and the brown 'tourist' signs for Donington Park on to the A453. Go past the Paddock Entrance turn-off for approximately 800 metres, then take the left exit slip road on to the B6540 signposted Donington Park and Castle Donington. 300 metres along this road brings you to the main entrance of Donington Park. Follow internal signs for the Exhibition Centre.

***From the North* via M6:** Leave the M6 at junction 15 heading for Trentham Gardens and Uttoxeter (A50 by-pass). Once on to the A50, continue right through and on to the new road section to the final roundabout where the right turn exit brings you to Hilton and the A5132. Picking up the signs for East Midlands Airport, continue on the A5132 through Willington to its junction with the A514. Take the right turn at this junction, over Swarkestone bridge picking up signs for Donington Park en route, passing the Paddock Entrance turn-off for approximately 800 metres, then take the left exit slip road on to the B6540. 300 metres along this road brings you to the main entrance of Donington Park. Follow internal signs for the Exhibition Centre.

AMPLE FREE CAR & COACH PARKS AT DONINGTON
ROUTES SIGNPOSTED TO DONINGTON PARK AND CASTLE DONINGTON

EDITORIAL

CASH & CARRY COAL

Yes, I'm sure that caught your attention and that's just what it is – cash and carry coal. Through the very good offices of our friend Derek Brown, one of the experts in the workshop at the Midlands Model Engineering Exhibition, we've been able to establish contact with one of the few private pits in South Wales still producing good quality steam coal.

Signalfern, which is part of Consolidated Coal plc, operates the Tyn-y-Wern pit in Glamorgan and is currently mining an extremely good steam coal, so good that Derek uses it and is busy extolling its virtues up and down the country wherever he runs his 7¼" gauge Hunslet locomotive. So far the Oxford, North London, Stamford and Melton Mowbray Societies are amongst those who are using this excellent source of supply. Following Derek's introduction, Signalfern have very generously agreed to sponsor the outside steaming at this year's Midlands exhibition and will be providing no less than two tonnes of Welsh steam coal for the week's activities. More importantly, however, they have a branch fairly local to Donington at Ripley in Derbyshire and they are arranging for one of their vehicles to be present every day at the exhibition where you can actually go and buy pre-packed Welsh steam coal nuts and beans. The nuts are 1"–2" size whilst the beans are ½"–1" size, and you will not only be able to see the coal and more importantly, enjoy seeing it in action as it is shovelled merrily into fireboxes by our traction engine enthusiasts, but you will be able to purchase coal to take home with you for running through the winter. In the past we've seen club coaches having lathes and machine tools loaded into the luggage space, but somehow I feel the coach operators and owners might draw the line at half a tonne of loose Welsh steam coal!

On a more serious note however, if you are looking for a good reliable supply of Welsh steam coal look no further, you'll be able to see it at Donington, talk to the producers and at the end of the day simply drive from wherever you are in the car park straight to the lorry and load up for the journey home. Quite apart from the very generous sponsorship that Signalfern have offered the exhibition, it is a chance for us all to ensure that we get good Welsh steam coal for our varying needs at a time when it is getting increasingly difficult to get this sort of quality coal.

STEAM BOAT ASSOCIATION

The Steam Boat Association of Great Britain (SBA) will again be present at this year's Midlands Model Engineering Exhibition. Members who attended last year thoroughly enjoyed meeting fellow engineers and promoting the association, and they are planning an even more interesting stand than last year. The SBA has about one thousand members worldwide, many of whom are also members of model engineering societies building locomotives, traction engines and other steam models.

However, steam on the water is rather special, and Great Britain has numerous inland waterways and lakes with launching facilities. Waterside public houses and picnic sites help to make an enjoyable day for the whole family and the challenge for the steam enthusiast is to make the steam plant work both reliably and purposely.

Actually getting on the water isn't too expensive and members of the SBA at the exhibition will be able to explain what is involved. It is possible to build the entire steam boat and steam plant or, alternatively, a fibre-glass hull can be obtained and merely the steam plant fitted. The cost can be tailored to suit the individual but it is relatively inexpensive for a small dinghy. The SBA arranges numerous rallies and provides a boiler inspection service and other technical advice. Non boat-owning members are usually found passenger places on board by rally organisers.

Engineering in Miniature published a series of excellent articles by Glyn Lancaster Jones in the early 1980s about the construction of steam boats and their equipment, and it is worth tracing these back issues. If you are interested in taking up steam boating, make sure you visit the SBA stand at Donington or alternatively contact the honorary secretary, Bill Hall, 54 Park Road, Chilwell, Beeston, Notts. NG9 4DD for further information.

OPEN WEEK

Graham Engineering will be holding an Open Week at their premises at Roebuck Lane, West Bromwich. It is actually slightly more than a week, because it will take place from Wednesday 1st October until Saturday 11th October, daily from 10am to 4pm. There will be a large range of goods on sale with many reductions and one-off bargains.

LNWR 0-6-2T 'COAL TANK' LOCOMOTIVE SERIES

For the next few months, there will be a pause in this very popular constructional series of articles while 'Hotspur' moves house. We apologise for this slight delay and promise that things will soon be back on track once again. However, 'Hotspur' has written an interesting description about building a freelance mill engine to help fill the gap in his construction series of articles, and this will be featured next month.

CORRECTION

In the final part of the Power Feed Gearbox series by D G Brown, an error crept into the text for the recommended type of oil. This should have been Shell Vitrea 320, rather than as printed. We apologise for any inconvenience caused.

FMEMS

Following the recent informal meeting attended by the representatives of the major FMEMS constituent organisations at which the election of new officers and the way forward for FMEMS was discussed, a board meeting was held on the 21st June.

The meeting was unanimous in ratifying the appointment of Peter Ellis as chairman and Shaun Casey as secretary/treasurer.

A vote of thanks was proposed to Bridget Deith, who had so ably led FMEMS through its difficult formative stages and this was supported by all present. Bridget had done an enormous amount of work and the hobby is indebted to her.

Concern was expressed that three of the founder members had withdrawn prior to the informal meeting, but it was pointed out that their individual members were able, and welcome, to join FMEMS in their own right and the hope was expressed that the lapsed members would rejoin in the future. Indeed, some of their members had been sufficiently concerned that they should benefit from being represented by FMEMS that they had attended the informal meeting.

The Pressure Directive had now been published and its implications for model engineers were considered in the light of resistance from some member organisations to the deliberations of the Boiler Committee. It was resolved that the secretary would contact the DTI for more comprehensive particulars. The Directive is known to be particularly complex and a report will be made in due course, following further consultation with the membership.

FMEMS continues to act on behalf of all model engineers in monitoring legislation which may affect them and making appropriate representations.

JIM CANNER 1935-1997

Sadly, Jim Canner, one of our popular authors writing in *Engineering in Miniature*, passed away at the Bristol Royal Infirmary on Wednesday 23rd July 1997 after his second heart by-pass operation, aged 62.

He was a popular member of Bristol Society of Model & Experimental Engineers and a keen supporter of the Wessex Stationary Engine Club. His opinions and his writings, often quite deliberately controversial, engendered many a lively discussion amongst model engineers at evening meetings throughout Britain and, though not always successful, his innovative ideas suggested that model engineering should evolve with the new technology and methods available today, rather than stagnate in the past. Certainly we shall miss his cheerful and undaunted approach to model engineering.

He leaves a wife, daughter Kim and two grandchildren, to whom we offer our deepest condolences at this sad time.

Nº 4 LIGHT TRACTION ENGINE

A design in 2" scale by IAN AMOR

Part Thirty-four

Continuing with the cylinder and its associated bits and pieces, there are a couple of covers which can be made at any time.

The valve chest cover is made from $^{1}/_{8}$" thick brass plate, which is cut to $2^{1}/_{16}$" square with the four corners rounded to $^{3}/_{32}$" radius. Mark out the bolt holes and drill them 2.85mm, 6BA clearance. Once this has been made the cover can be used as a drilling jig to spot the stud holes in the cylinder block which should then be drilled 2.30mm and tapped 6BA. With the studs made and fitted, the effective part of the valve chest cover is complete.

The name plate, which will be available as a lost wax casting, is separate and is screwed on. The screws, which need be no larger than 10BA and countersunk, pass through the valve chest cover from the inside and then through a part of the nameplate background. The protruding ends are then cut back flush to the nameplate. Four screws should be quite sufficient and a spot of Loctite on each wouldn't come amiss.

The other cover is the front cylinder cover. The casting for this has three chucking lugs cast on the front face and the contact faces of these should be cleaned up with a file so that there is no danger of 'wedging' when the chuck jaws are closed up on them. The casting should now be set in the three jaw chuck and adjusted so that there is little or no wobble on the flat face of the cover. The domed face of the cover should also be a little away from the chuck jaws to allow the edge to be completely surfaced without the turning tool touching the chuck jaws.

Begin the machining by reducing the outside diameter of the cover to $1^{15}/_{16}$" diameter extending the cut just a little way up the chucking stubs. Next reduce the cover thickness to $^{7}/_{32}$" plus about 0.015" to 0.020" – this extra thickness will be the machining allowance on the outside of the cover. Now form the $1^{3}/_{32}$" diameter $^{3}/_{32}$" deep spigot, this can be machined to the dimension or use the cylinder as a gauge. A small amount of rattle on this cover will cause no problems. The last piece of turning on this side of the cover is the centre recess. Let me first however put this into perspective, it is drawn this way because the original was made this way. The purpose of the recess then was as is now; it is there to provide clearance for the nut on the piston face. All this means is that if you cannot make the recess quite like that shown on the drawing, it does not matter as it cannot be seen and, as long as the clearance is there, O.K!

The simple way to put in the recess is to use a $^{7}/_{16}$" diameter ball nose slot drill and cut in $^{3}/_{16}$" deep. Failing that, a form tool could be made – plenty of front clearance will be needed mind, or alternately just drill a shallow hole and 'ad lib' with a boring tool against a radius gauge. For those that have a rotary table, now is an ideal time to transfer the set up, chuck and all, to the accessory for drilling the 6BA clearance holes for the studs.

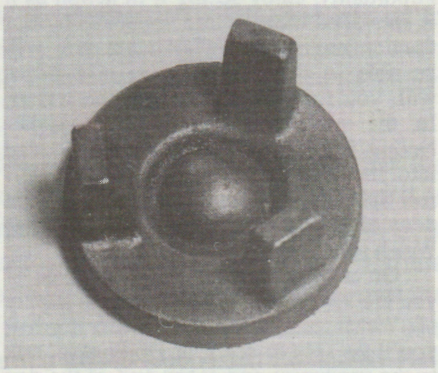
Remove the cover from the chuck and saw off the chucking stubs. The cover must now be held by the $1^{3}/_{32}$" diameter spigot in the three-jaw chuck for facing the outer face. Use a sharp tool, be gentle and take light cuts – it is not that difficult to dislodge the cover from what is after all only a tenuous grip. Just face outer flat surface, do not try to machine any other part of the cover.

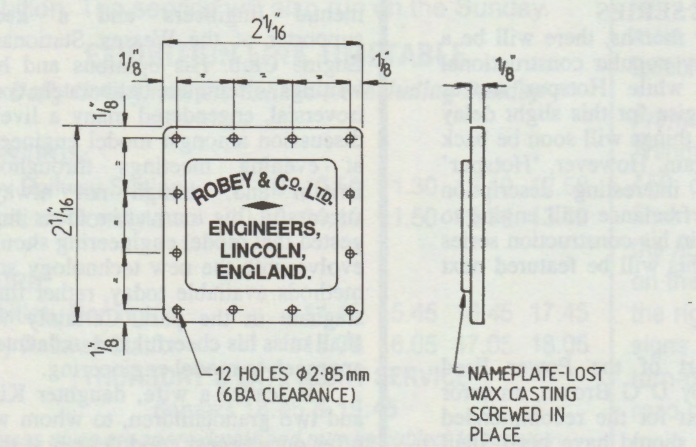
With all that done, this cover also can be used as a drilling jig to spot the holes for the retaining studs on the cylinder end.

Moving up to the top of the cylinder block, the regulator chest could well be the next cavity for filling. Sounds a bit like a dentist; by the way, can anyone tell me what an occlusal is? It seems that I have one in my mouth but is not described precisely in my dictionary! But back to the plot, begin with making the regulator rod. There is once more the choice of materials so pick yours, and also the choice of methods of manufacture between a fabricated construction or carving from the solid. For this rod there is little or nothing to choose between the two methods. If carved from the solid, then a travelling steady must be used to get the tail of the rod absolutely parallel – it must not bind in the gland.

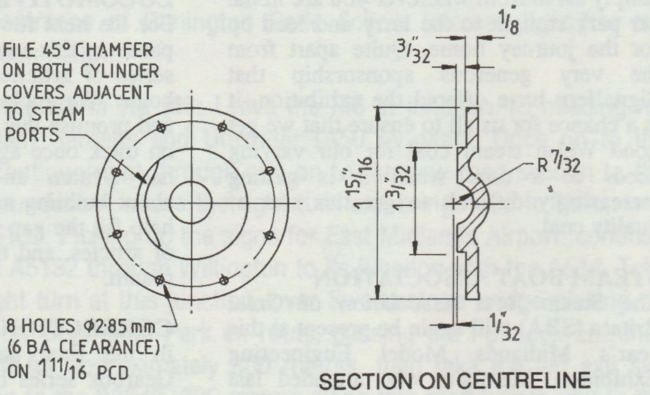
The next item is the regulator valve itself. Begin by reducing the end of a piece of $^{9}/_{16}$" diameter brass bar to $^{1}/_{4}$" diameter for a length of $^{1}/_{4}$". To produce the footprint of the valve mill off $^{3}/_{32}$" from

The casting for the front cylinder cover before machining, showing the chucking stubs.

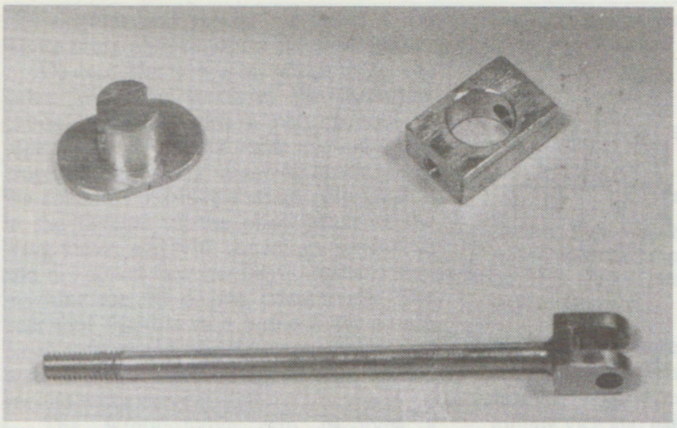




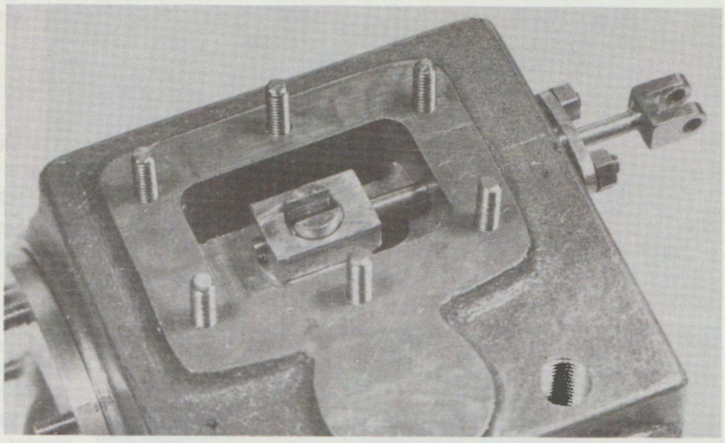
VALVE CHEST COVER
1 off Brass



FRONT CYLINDER COVER
1 off Gunmetal

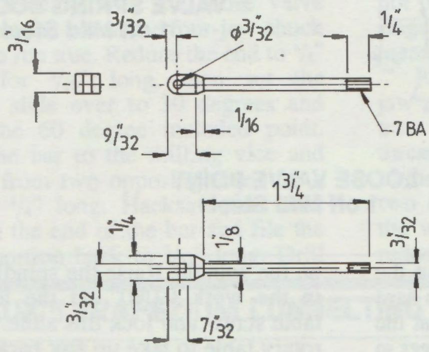


The three components of the regulator shown separately.

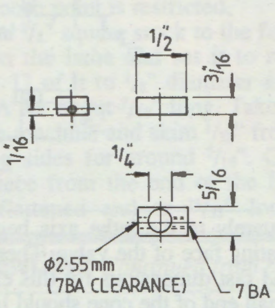


The regulator assembled in the valve chest.

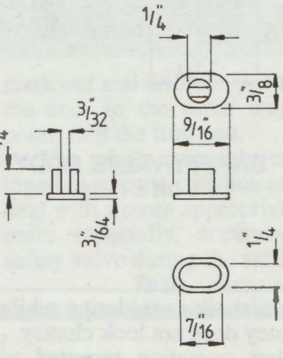
diametrically opposite sides of the bar for no more than about $^{1}/_{8}$" back from the end of the full diameter section of the bar. Now saw off the embryo valve leaving the flange of the valve around $^{1}/_{16}$" thick. Mount the valve in the three-jaw chuck and face back the flange to $^{3}/_{64}$" thick.



REGULATOR ROD
1 off Stainless Steel



REGULATOR BUCKLE
1 off Brass or Gunmetal



REGULATOR VALVE
1 off Brass or Gunmetal

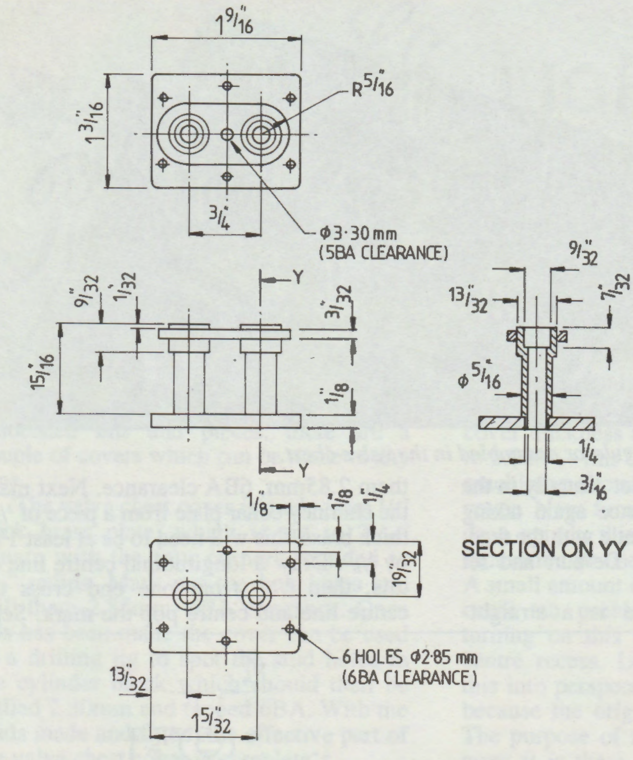
Take the valve now to the milling machine and set it on a parallel between the vice jaws so that when set inverted, that is with the $^{1}/_{4}$" diameter portion downwards and the flange uppermost, the flange is just below the surface of the vice jaws. Nip up the jaws firmly but without undue force – this flange is relatively easy to distort. Fit a $^{1}/_{4}$" diameter slot drill in the milling chuck and relieve the face of the valve as per the drawing. It may not be a bad ploy to do this in two cuts even though the depth is only 0.015". For the beginners, it may well be pointed out that there is very good reason for this relief, small as it is. The regulator valve needs to be steam tight when it is closed and it is only steam pressure keeping it that way. Should a small piece of dirt get trapped under the valve face the valve would be cocked and a steam leak would be created. If the valve face were to be a full flat surface there would be plenty of scope for such a build up of dirt or oil to occur, never mind the effect of even the slightest doming of the supposedly flat surface. With the contact face reduced in the way I have shown, there is less likelihood for such a build up to occur added to which the point loading of the valve face is also increased. To complete the valve, reverse it in the milling vice so that the relieved face is downwards and nip up the vice once more. Change the milling cutter to a $^{3}/_{32}$" diameter slot drill, set it to cut the slot centrally in the $^{1}/_{4}$" diameter stub and, once again taking smallish cuts and being gentle with the feed, cut the slot to full depth. De-burr and set aside.

The regulator buckle is a straightforward job and is the last item to be made for the regulator. Now comes the assembly. First pass the regulator rod through the clearance hole in the buckle and then screw it into the thread. Next slip the regulator valve into the $^{1}/_{4}$" diameter hole in the buckle. The valve must be a free fit in the buckle with the slot around the valve rod. There must be NO binding, if necessary ease the slot with a needle file, in fact do whatever is needed to ensure that the regulator is free to move in the buckle. With that done, dismantle the parts and then re-assemble again but this time inside the regulator chest. The check now is for full and free movement of the valve, particularly at the closed position. The regulator valve must still be loose and floating, just five or ten thou is enough – the valve must always be free enough to allow steam pressure to press it down flat on the valve chest face. To achieve this it may be necessary to skim the underside of the valve buckle.

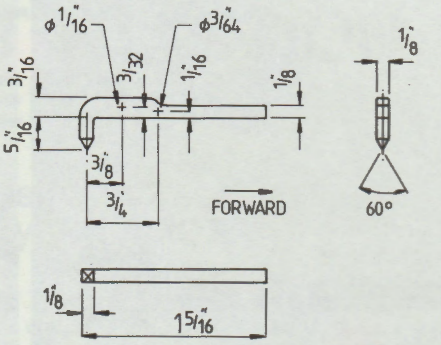
The next logical step is the valve chest cover which of course houses the safety valve. Cut a piece of $^{1}/_{8}$" thick brass sheet $1^{9}/_{16}$" by $1^{3}/_{16}$" and radius the corners. Mark a longitudinal centre line and on this mark and centre pop the position of the two steam chimney holes. These should be drilled $^{1}/_{4}$" diameter. Now mark and centre pop the six stud holes and then drill them 2.85mm, 6BA clearance. Next make the chimney collar plate from a piece of $^{3}/_{32}$" thick brass, this will need to be at least $1^{3}/_{8}$" by $^{5}/_{8}$". Draw a longitudinal centre line on this, then $^{5}/_{16}$" from one end cross the centre line and centre pop the mark. Set a pair of dividers to $^{3}/_{8}$" radius and, from the centre pop, cross the centre line again. Extend the radius to $^{3}/_{4}$" and cross the centre line for a third time; centre pop these two crossings also. Re-set the dividers to $^{5}/_{16}$" radius and scribe a semi-circle around the two end pop marks. Join these two semi-circles with tangential lines top and bottom and cut out the resulting oval plate. Step drill the two end holes up to a diameter of $^{13}/_{32}$" and drill the centre hole 3.30mm, 5BA clearance.

Mount a piece of $^{7}/_{16}$" diameter brass bar in the three-jaw chuck with around $1^{1}/_{4}$" clear of the jaws and face and centre the end. Drill in $^{3}/_{16}$" diameter for around $1^{3}/_{16}$" deep. Reduce the end of the bar to $^{5}/_{16}$" diameter for a length of $^{25}/_{32}$" and then further reduce the first $^{1}/_{8}$" to $^{1}/_{4}$" diameter. Part the piece off at $1^{1}/_{16}$" total length.

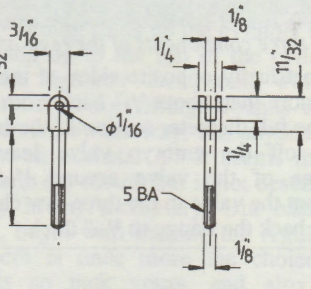
Reverse the piece in the chuck so that the top end can now be worked on. Begin by opening up the drilling to $^{9}/_{32}$" diameter $^{7}/_{32}$" deep. If necessary, now very lightly face the end to produce a clean sharp corner to this hole. It is this edge which is the seating for the safety valves. Next, reduce the outside diameter of the first $^{1}/_{8}$" to a clearance fit in the collar plate which is of course $^{13}/_{32}$" nominal, then reduce the remainder of the $^{7}/_{16}$" diameter portion to $^{13}/_{32}$" plus some five to ten thou. The idea is that the collar plate has the slightest of



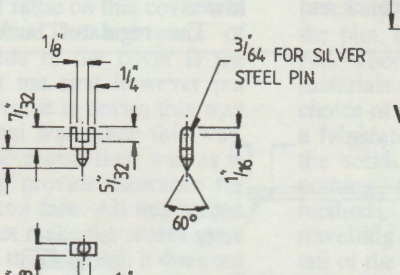
SAFETY VALVE BODY
1 off Brass



SAFETY VALVE ARM
1 off Mild Steel



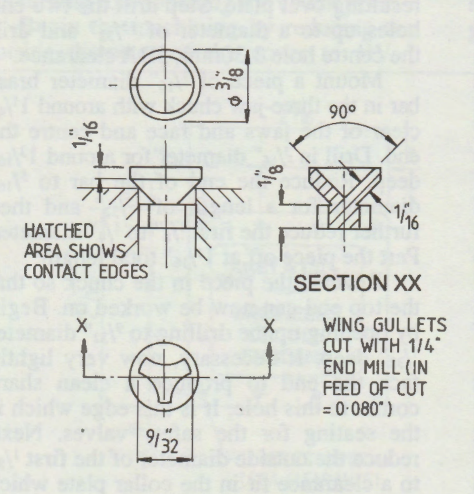
VALVE SPRING BUCKLE
1 off Mild Steel



LOOSE VALVE POINT
1 off Mild Steel

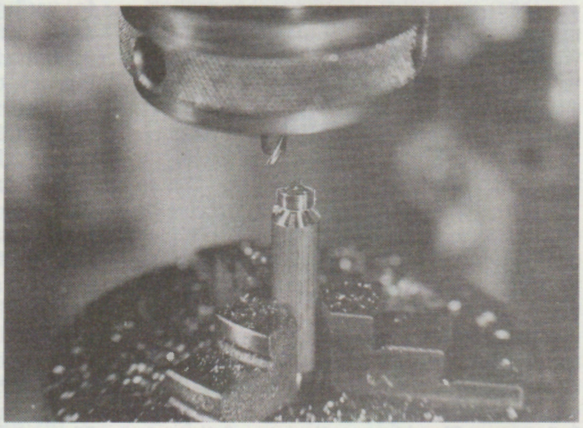
lips to sit on whilst silver soldering while the steam chimney does not look clumsy.

With the last operation repeated to produce the second steam chimney, all four pieces can be silver soldered together to produce the safety valve body. Moving on next whilst brass is still in the machine, the two wing valves can be made. Mount a piece of 3/8" diameter brass bar in the three-jaw chuck and reduce the end to 9/32" diameter for just over 1/8" in length. This should be an easy fit in the steam chimneys. Now grind up a tool similar to that in the photograph with the wing valves – this is a left hand tool, that is one which cuts away from the chuck. Set the compound slide over to 45 degrees and with the tool set squarely to the lathe axis begin to cut the seating face of the valve. There are no hard and fast dimensions for this except that the small end of the cone should be no larger in diameter than the solid core of the wings, in this case around 1/8". It is when cutting this cone seating that the wing portion is brought to length.

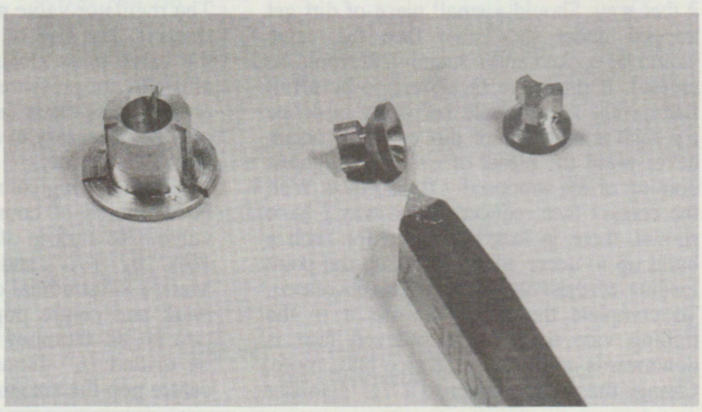

ϕ 3/8"
90°
1/16"
1/8"
1/16"
HATCHED AREA SHOWS CONTACT EDGES
SECTION XX
X
X
WING GULLETS CUT WITH 1/4" END MILL (IN FEED OF CUT = 0·080")
9/32"

WING VALVE
2 off Gunmetal

Now to cut the wings. Mount the three-jaw chuck complete with the part made valve on to the rotary table on the milling machine with the work vertical. Align the centres of the milling spindle and the work. Lock the cross-slide and retract the longitudinal slide. Mount a 1/4" diameter slot drill in the milling chuck and bring up the work so that the cutter just touches the side. Bring the spindle down so that the cutter lips are about 1/64" below the bottom of the wing portion and set the limit stop on the spindle. Raise the spindle and feed in the work 0.080" on the longitudinal table screw and lock this slide. Rotate the rotary table to take up any backlash, set it to a suitable angle and lock this as well. Now, with the machine running, bring down the cutter and cut the first gullet. Retract the cutter, index the rotary table



Above right: Milling the gullets on a partly machined wing valve.



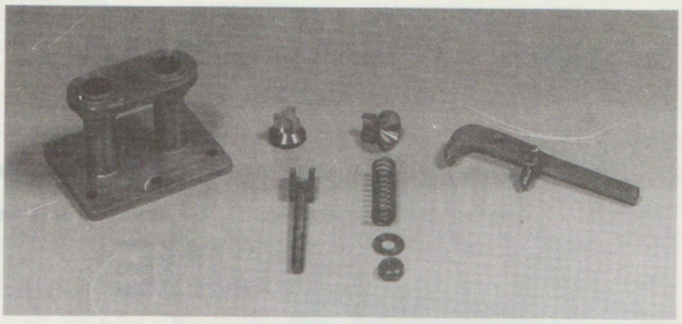
The completed wing valves together with the collet for the countersinking operation and the lathe tool for machining the cone seats.

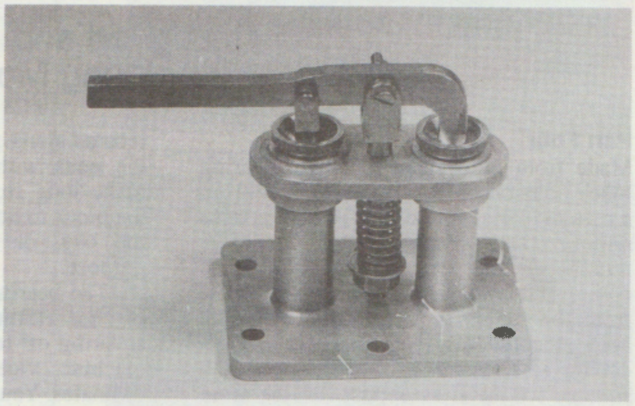
120 degrees and repeat the cut. Do the whole thing once more for the third gullet.

De-burr the job and return it to the lathe. With the work in the three-jaw chuck, enter in with a parting tool to separate the first wing valve leaving a $^{1}/_{16}$" length of the full $^{3}/_{8}$" diameter stock above the coned face. Make a small collet, again in the fashion of the photograph of the wing valve, and with the wings pressed in and the coned face hard against the collet, machine the 90 degree countersink. The best tool for this is a home made D-bit. Keep cutting and measuring until the cone wall is $^{1}/_{16}$" thick. Repeat all for the second wing valve.

The safety valve arm involves a straightforward marking out, hacksawing and filing job. The point is also filed on. It is important to get the point centre, the spring buckle centre and the loose valve point centre true – if they are not, the safety valve spring pressure will not be central on the wing valves.

The next two parts, the loose valve point and the spring buckle are both made on the end of a piece of $^{1}/_{4}$" square mild steel bar. Starting with the loose valve point, mount the bar in the four-jaw chuck and set it to run true. Reduce the end to $^{1}/_{8}$" diameter for $^{3}/_{16}$" long, then set the compound slide over to 30 degrees and machine the 60 degree included point. Transfer the bar to the milling vice and skim $^{1}/_{16}$" from two opposing sides for a little over $^{1}/_{4}$" long. Hacksaw this little piece from the end of the bar and file the flattened portion back to $^{7}/_{32}$" long. Drill the $^{3}/_{64}$" diameter hole and radius the end. This can now be gripped in the milling vice and using a $^{1}/_{8}$" diameter slot drill, taking light cuts produce the fork end. Turn a little $^{3}/_{64}$" diameter silver steel pin and join the loose point to the arm and lightly peen over both ends of the pin. The pin should be as short as reasonable for the appearance and must not be clenched to the stage where the movement of the loose point is restricted.


The component parts of the safety valve.


Below: The completed safety valve. The arm on this valve points engine forward.

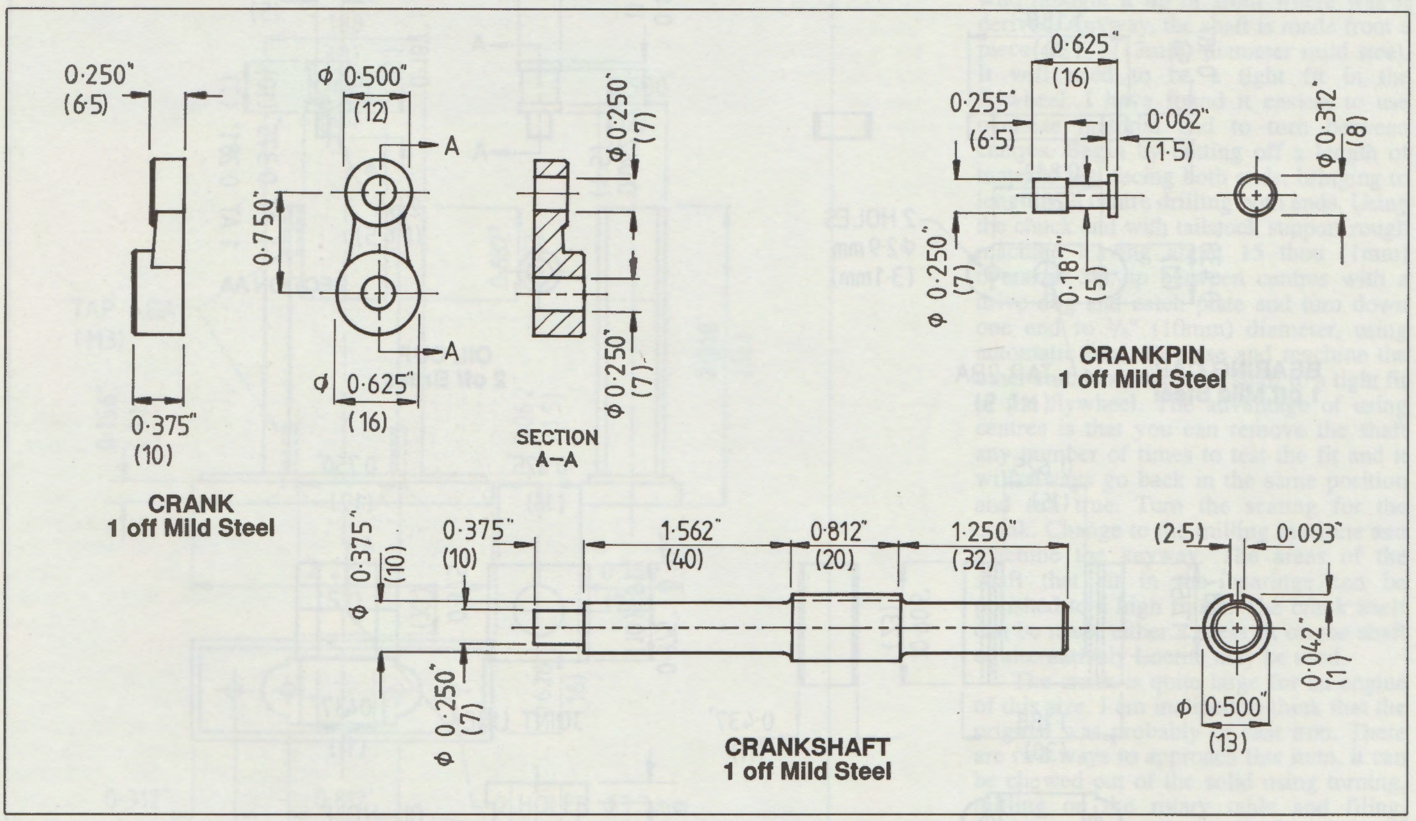
Return the $^{1}/_{4}$" square stock to the four jaw chuck on the lathe and set it to run true. Reduce 1" of it to $^{1}/_{8}$" diameter and thread it 5BA for about $^{7}/_{16}$" long. Take it to the milling machine and skim $^{1}/_{32}$" from two opposing sides for around $^{7}/_{16}$". Cut the whole piece from the end of the bar reduce the flattened end to $^{11}/_{32}$" long, mark out and drill the $^{1}/_{16}$" hole and radius the end. In the same way as the loose point, mill the fork end.

The whole assembly can now be put together using a convenient spring. I shall deal with a more appropriate one later, but more especially, accurately setting the safety valve during the setting up stage.

To be continued.

REULEAUX'S TRAPEZIUM CONNECTING ROD ENGINE

Continued from page 103

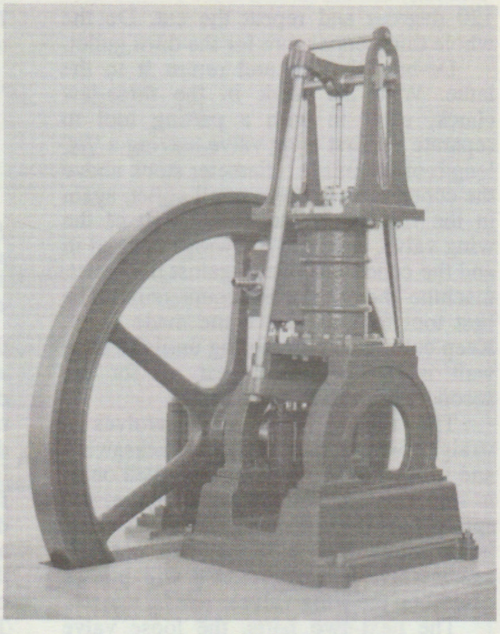


yet it only involves simple turning. Again it can be made a press fit or Loctite can be used to hold it in position.

Oil cups are always a prominent item especially if highly polished, and again they are quite simple to turn. If a female holder tapped 2BA (M5) is made, the oil cups can be threaded and parted off as a batch and then screwed into the holder for external turning, drilling and polishing. If you have difficulty removing them from the holder, try gripping them in the tailstock chuck and turning the headstock backwards to free them. Note that one oil cup is shorter than the other – the short one goes with the bearing under the engine.

To be continued.

REULEAUX'S TRAPEZIUM CONNECTING ROD ENGINE



Model designed and described by Anthony Mount

Part Four

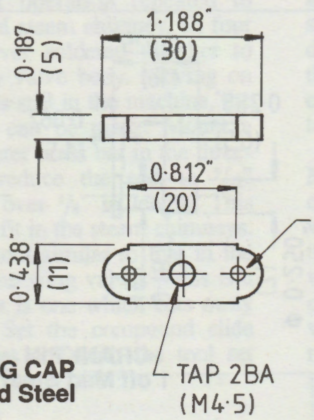
Made from mild steel, the main bearing block bolts on to the base. Machined from a rectangular slab, the first operation is to remove the waste material from the middle. A hole can be drilled in each corner and a hacksaw used to cut down from the top to the hole. I recently got hold of some saw blades that will fit a coping saw frame, but with finer teeth suitable for metal as opposed to the more usual type used for wood. These are just the job for sawing between the two holes at the bottom of the block. An alternative is to drill a series of holes, which can be connected by the aforementioned saw. Set up in the machine vice and mill the cutout to size.

Drill and tap for the stud holes. Then, while still in the machine vice, mill rebates along the edges and then round the ends with a file. You can either make long studs to pass right through the block to hold it to the base and to fix the cap, or separate ones for each purpose.

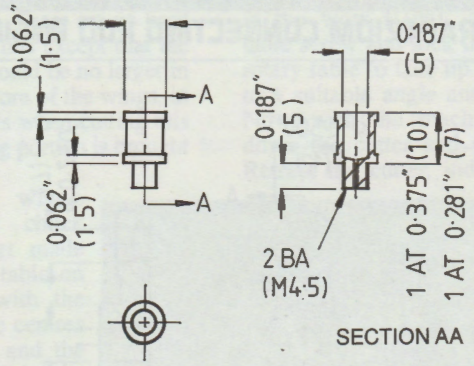
The bearing caps are cut from strips of 3/16" (5mm) mild steel and, after squaring off to length, can be held in the machine vice for drilling, using co-ordinates. You will find that it will be just as quick to file the rounded ends as to mill them.

Called 'brasses', the bearings could with advantage be made from bronze or gunmetal rather than brass as the former are better bearing materials. The bearings are of the split variety and can be made in a variety of ways. The usual method is to soft solder two strips of brass together, somewhat oversize and then bring to overall dimensions using the milling machine or the lathe and the four-jaw chuck. In the lathe, drill and ream the bearing hole and then mill the slots in the edges, noting that they are different widths. The oil way can be drilled when test assembled using the cover as a guide.

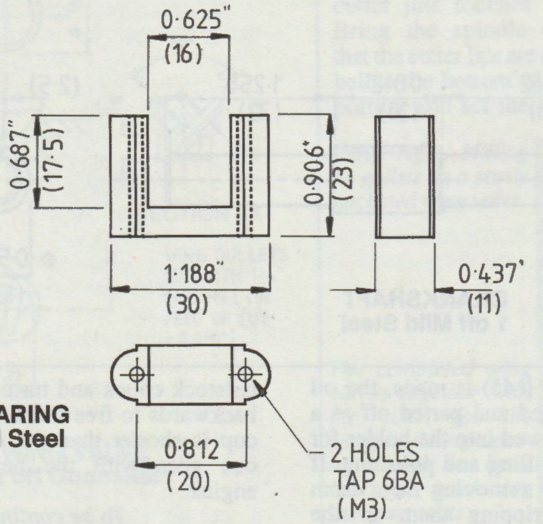
The outer bearing is a longer version of the other bearing and has a large foot that holds it down to the foundations. The foot can be silver soldered to the body or held on with screws from underneath.



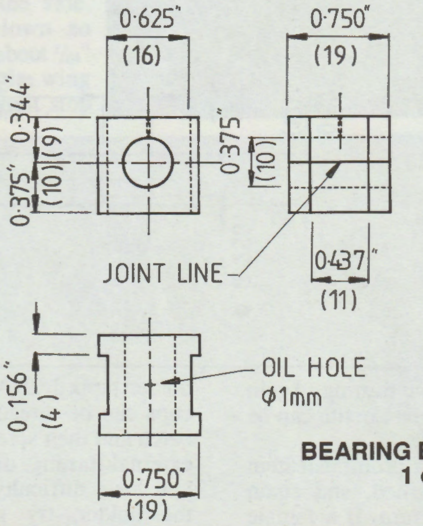
BEARING CAP
1 off Mild Steel



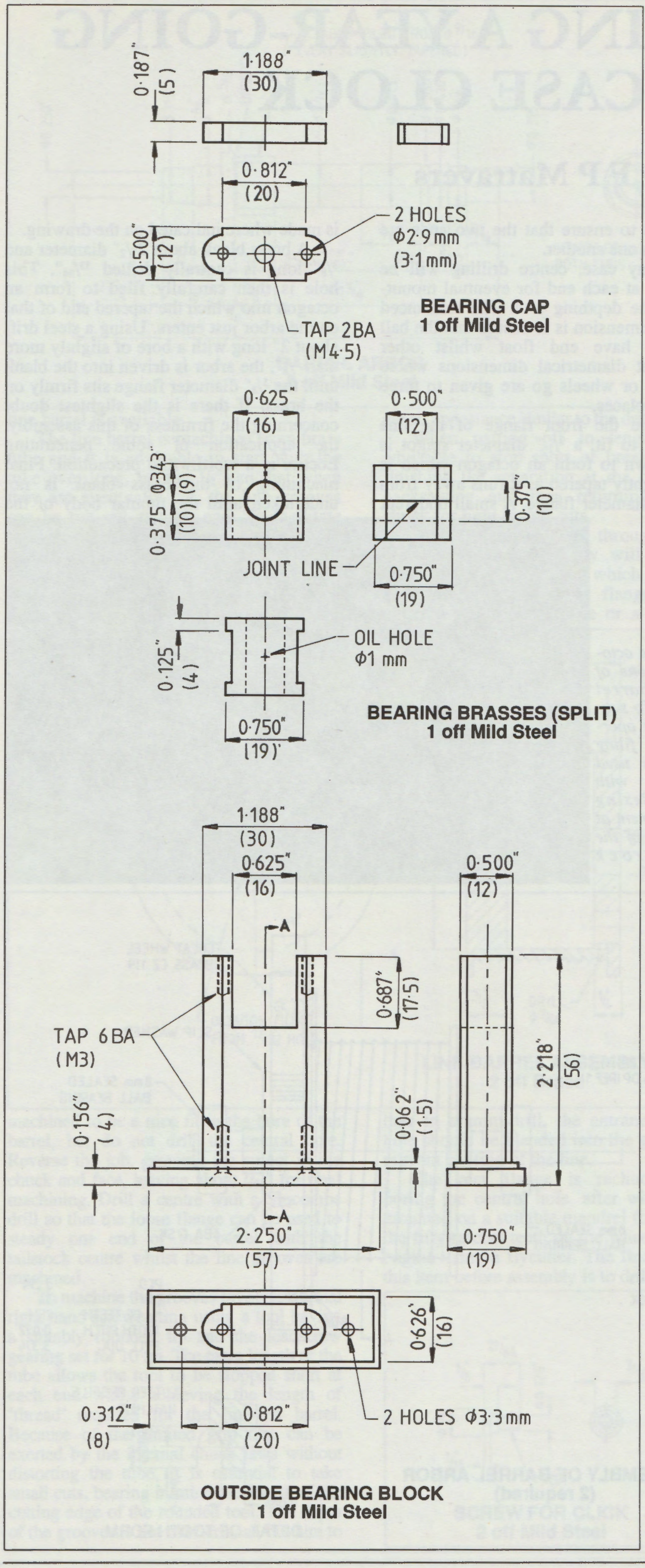
OIL CUP
2 off Brass



MAIN BEARING
1 off Mild Steel



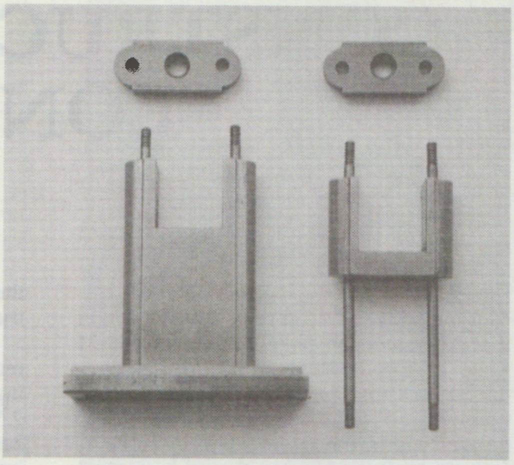
BEARING BRASSES (SPLIT)
1 off Brass



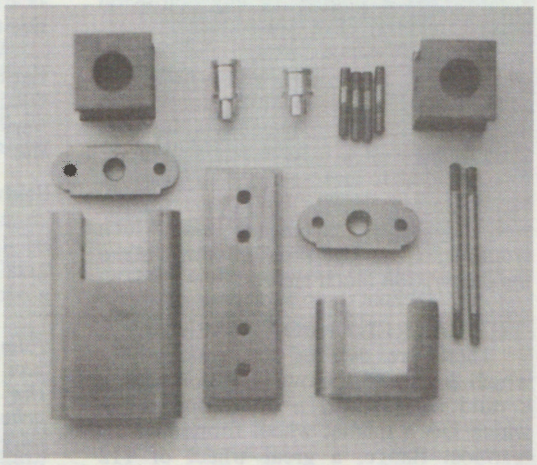
BEARING CAP
1 off Mild Steel

BEARING BRASSES (SPLIT)
1 off Mild Steel

OUTSIDE BEARING BLOCK
1 off Mild Steel



The two bearing supports with their caps.



The component parts of both main bearings.

I wonder how the crank got its name, who thought it up or from where was it derived. Anyway, the shaft is made from a piece of $^1/_2$" (13mm) diameter mild steel. It will need to be a tight fit in the flywheel. I have found it easiest to use oversize material and to turn between centres. Begin by cutting off a length of material and facing both ends, bringing to length and centre drilling both ends. Using the chuck and with tailstock support rough machine leaving about 15 thou (1mm) oversize. Set up between centres with a drive dog and catch plate and turn down one end to $^3/_8$" (10mm) diameter, using automatic feed. Reverse and machine the other end. Now skim the shaft to a tight fit in the flywheel. The advantage of using centres is that you can remove the shaft any number of times to test the fit and it will always go back in the same position and run true. Turn the seating for the crank. Change to the milling machine and machine the keyway. The areas of the shaft that sit in the bearings can be polished to a high finish. The crank itself can be made either a press fit on the shaft or alternatively Loctite may be used.

The crank is quite large for an engine of this size. I am inclined to think that the original was probably of cast iron. There are two ways to approach this item, it can be chewed out of the solid using turning, milling on the rotary table and filing, while another possibility is to turn up the bosses from round rod and to form the web as a separate item and to silver solder them all together.

The crankpin is quite small in size and

Continued on page 101

CONSTRUCTING A YEAR-GOING LONGCASE CLOCK

by F P Matravers

Part Three

You may have noticed that Table 2, which was illustrated on page 35 of the August issue of *Engineering in Miniature*, contained a mistake. The escape wheel revolves **60** times per hour, not 50 as typeset within the table. Also, in Table 1, Ref. 9, the full diameter should have read **1.288"**. We apologise for any confusion these errors may have caused.

While checking through the text, it was noticed that a few words had gone missing in the penultimate paragraph in the first column on page 35. Within this paragraph, it should have read: 'I therefore decided to use sealed ball bearings **for these arbors**, for the arbors for the weight pulleys (the bearings of which would . . .' etc. The missing words make the description much clearer.

THE BARREL ARBOR ASSEMBLY

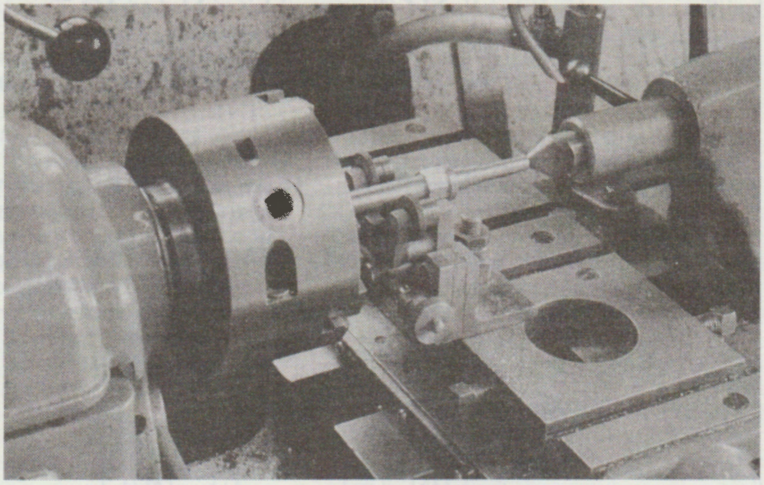
There are two of these assemblies which are shown below, each comprising a mild steel arbor, a brass line barrel which has a ratchet wheel formed on its rearmost flange, a great wheel of 112 teeth held in position by a slip-washer and carrying the ratchet click and spring, and two 8mm sealed ball races.

The mild steel arbors are another job calling for lathe work between centres since there is a fair amount of accurate turning required at each end, together with the need to ensure that the two ends are true with one another.

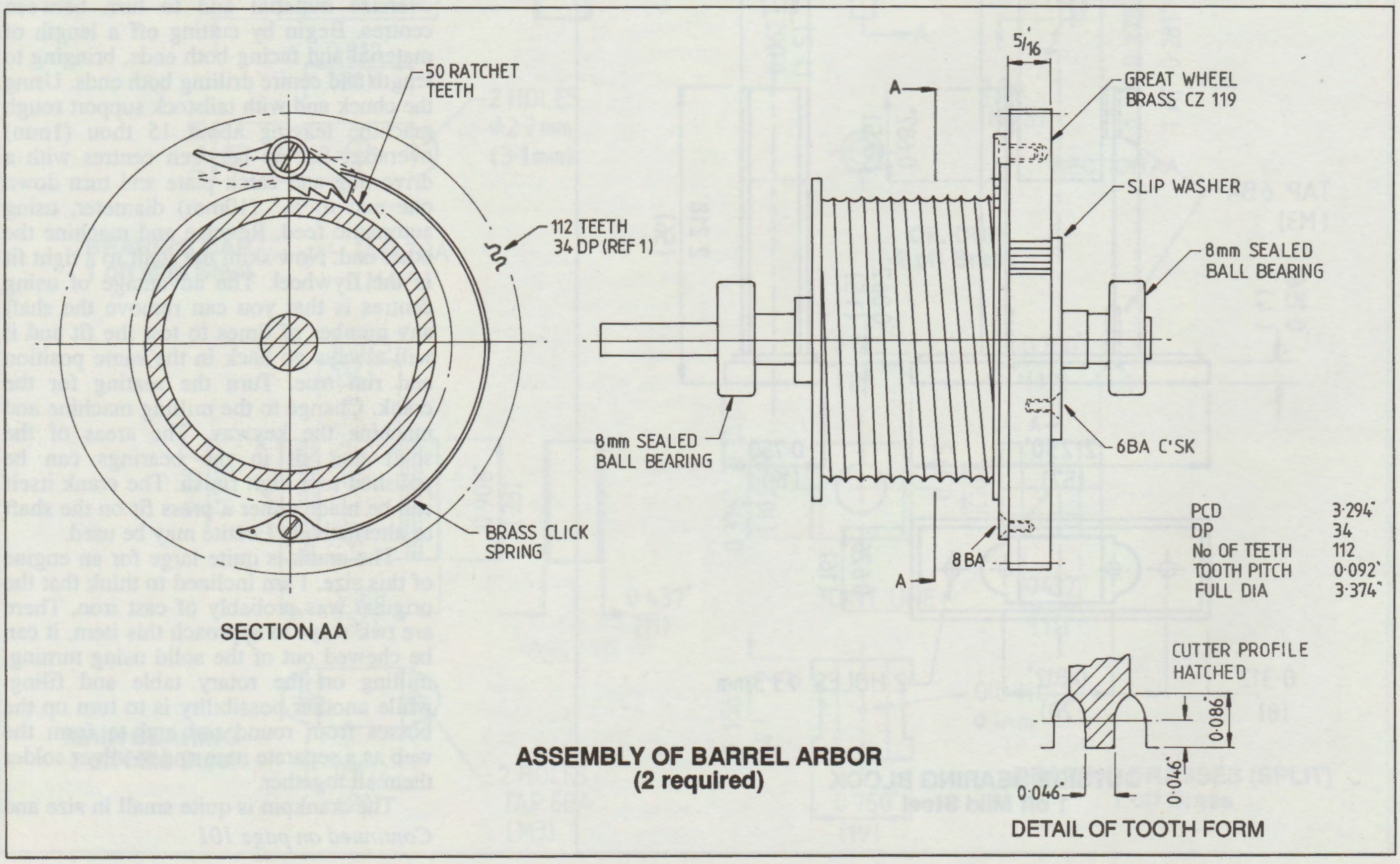
In any case, centre drilling will be required at each end for eventual mounting in the depthing tool. The toleranced 2.560" dimension is to ensure that the ball bearings have end float whilst other important diametrical dimensions where bearings or wheels go are given to three decimal places.

Where the front flange of the line barrel is to fit, a $\frac{9}{16}$" diameter spigot is filed down to form an octagon which is very slightly tapered as it runs away from the $\frac{5}{8}$" diameter flange. A small undercut is made where indicated on the drawing.

A brass blank about $2\frac{1}{2}$" diameter and $\frac{3}{8}$" long is centrally drilled $\frac{33}{64}$". This hole is then carefully filed to form an octagon into which the tapered end of that on the arbor just enters. Using a steel drift about 2" long with a bore of slightly more than $\frac{3}{8}$", the arbor is driven into the blank until the $\frac{5}{8}$" diameter flange sits firmly on the brass. If there is the slightest doubt concerning the firmness of this assembly, the application of some penetrating Loctite is a worthwhile precaution. Final machining of the brass blank is not undertaken until the tubular body of the



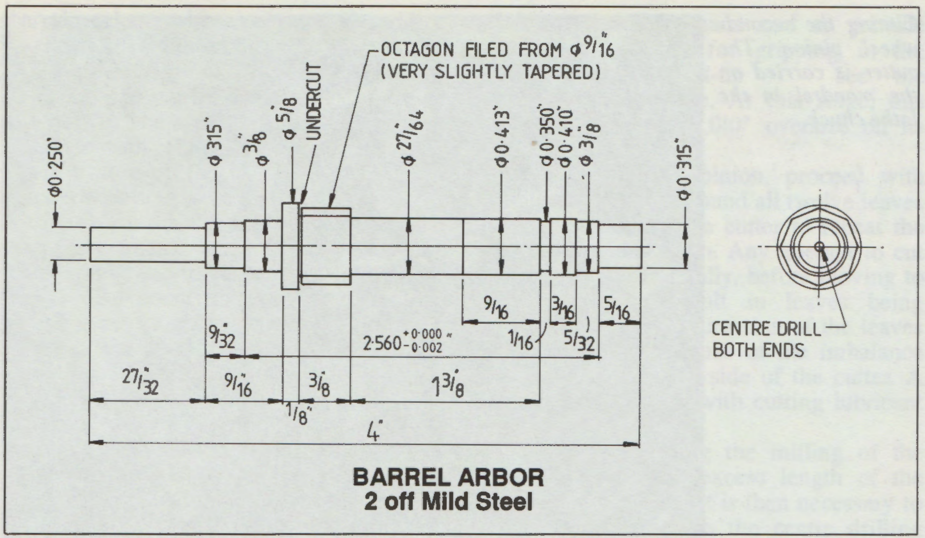
Filing the octogan on one of the barrel arbors. To simplify this operation, a filing rest was used together with an indexing arrangement at the rear of the headstock spindle.



SECTION AA

ASSEMBLY OF BARREL ARBOR
(2 required)

DETAIL OF TOOTH FORM

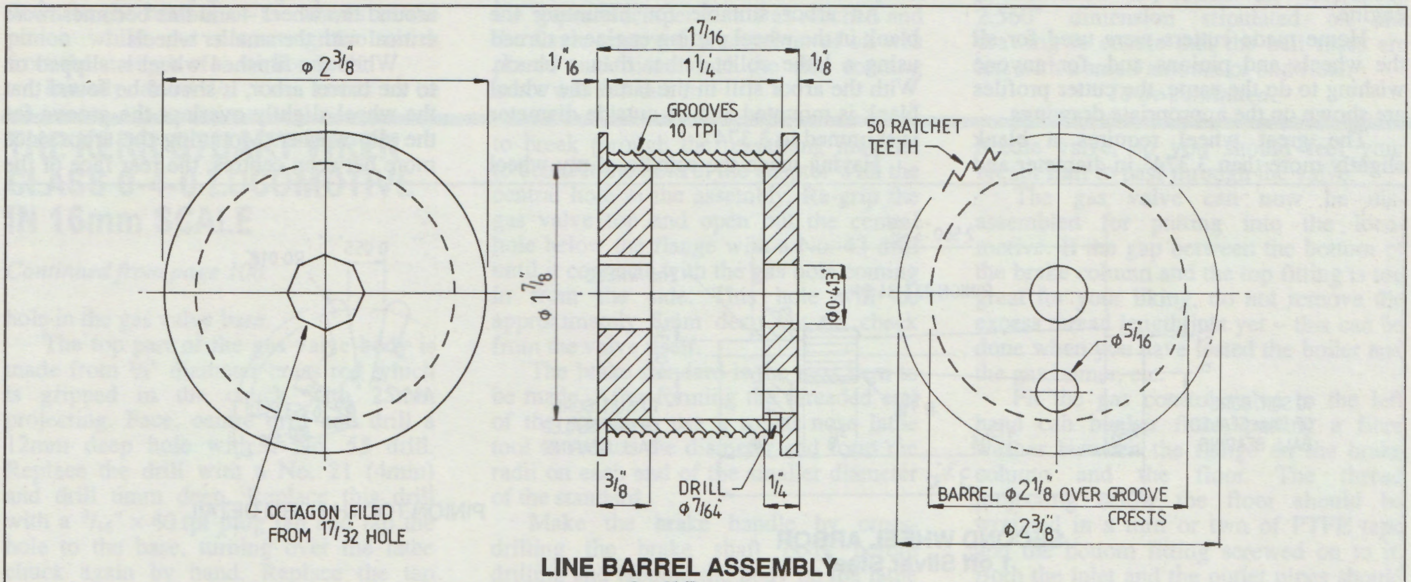


BARREL ARBOR
2 off Mild Steel

line barrel is available.

The line barrel is machined from brass tube and it is advisable to start with the tube over-long, by say 1/2", so that when they are eventually cut, the line grooves can be run out at each end. To facilitate this, the external diameter of the extra 1/4" at each end is reduced by 3/32".

Next, the blank for the combined rear barrel-flange and ratchet wheel is turned. The 1/4" spigot on this item should be machined to be a nice fit in the bore of the barrel, but do not drill the central hole. Reverse the job, gripping the spigot in the chuck and face, leaving about 1/32" for final machining. Drill a centre with a Slocombe drill so that the loose flange can be used to steady one end of the barrel with the tailstock centre whilst the line grooves are machined.



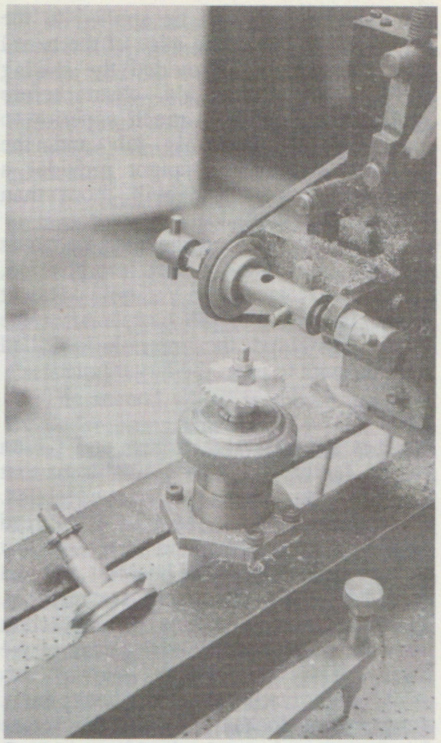
LINE BARREL ASSEMBLY
2 off Brass

To machine the grooves involves normal right hand screwcutting using a tool having a suitably rounded tip and the leadscrew gearing set for 10 tpi. The extra length of the tube allows the tool to be stopped short at each end whilst achieving the length of 'thread' required for the finished barrel. Because of the limited grip that can be exerted by the internal chuck jaws without distorting the tube, it is essential to take small cuts, bearing in mind the length of the cutting edge of the rounded tool. The depth of the grooves is not over-critical, but aim to get an appearance similar to the drawing.

When parting off to length, it is advisable to stop short of breakthrough, finishing the separation at the bench by hacksawing and then returning to the chuck for light facing cuts.

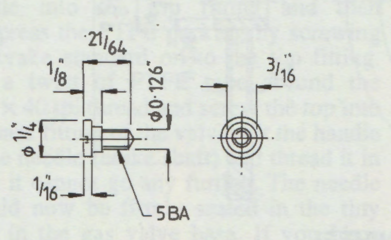
A 7/64" diameter hole, through which the weight-line eventually will pass, is drilled into the groove which will be adjacent to the rearmost flange. Using either a round needle file or a dentist's burr in a mini-drill, the entrance to the hole should be blended into the groove to prevent chafing of the line.

The rear flange is rechucked for boring the central hole, after which it is mounted on a suitable mandrel for cutting the fifty ratchet teeth on the wheel cutting engine using a flycutter. The final job on this item before assembly is to drill the 5/16" hole which facilitates the knotting of the weight line.

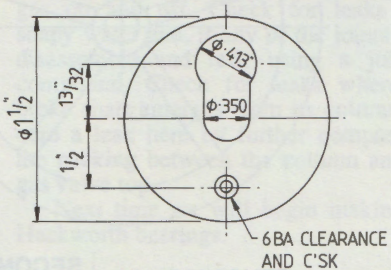


Cutting a ratchet wheel using a fly-cutter. A circular cutter as used for wheel teeth is also shown mounted on its mandrel.

The barrel arbor, complete with the now firmly attached brass blank, is set up again between centres for final machining of the front barrel flange. As for the rear flange, the spigot should be a nice, but not over-tight, fit in the bore of the barrel so as to allow space for the Loctite retaining



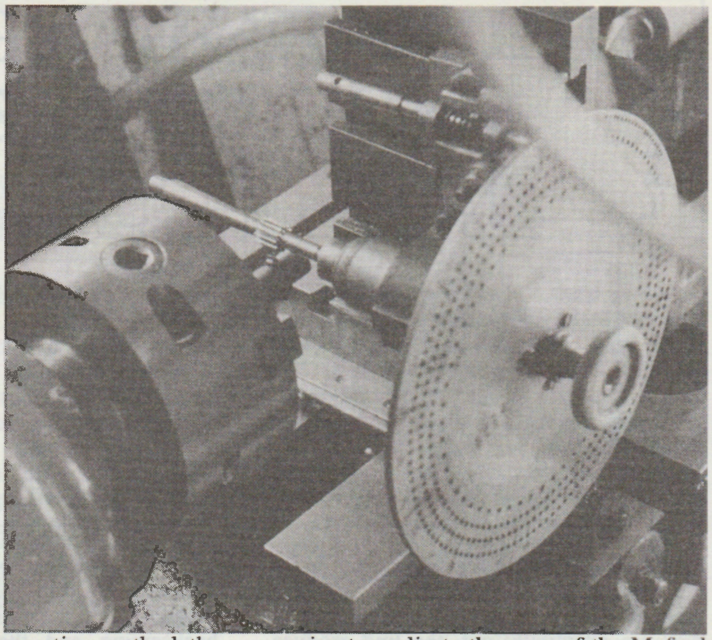
SCREW FOR CLICK
2 off Mild Steel



SLIP WASHER
2 off Brass (1/16" thick)

compound which will be applied to the spigot and to the inside edge of the barrel prior to assembly. Provided the mating surfaces are thoroughly clean before application, Loctite is much superior to soft soldering for this job and the generous size of the spigot provides a joint which, in shear, will more than amply cope with its loading.

At the same time the rear flange is similarly treated and pushed into position, taking care to locate the 5/16" hole adjacent to the line hole in the barrel. After the Loctite has cured, the line hole is drilled right through to meet the larger hole.



Cutting the second-wheel pinion. The cutter is carried on the mandrel in the lathe chuck.

THE GREAT WHEEL

It is assumed that a gear and pinion cutting facility is either available or that this work can be put out to a specialist. For my own part, I adapted a Myford lathe by bolting a mandrel to the vertical slide, with a collet at the business end and an index plate with detent at the other. The cutter, carried on an arbor mounted in a chuck, worked on the lower edge of the blank. The photograph shows this arrangement cutting the 2nd wheel pinion. For my first clock, I also used this set-up for cutting the wheels, but it was laborious for large numbers of teeth and so I eventually made up a wheel cutting engine.

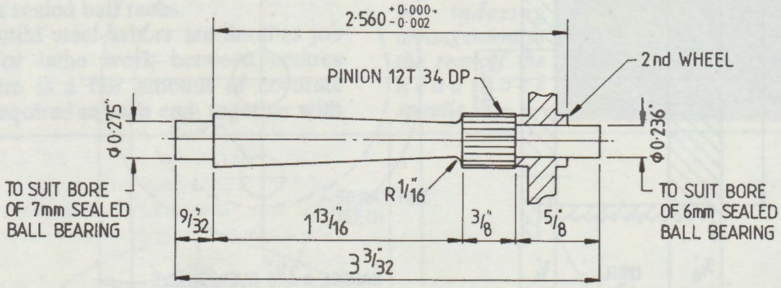
Home made cutters were used for all the wheels and pinions and, for anyone wishing to do the same, the cutter profiles are shown on the appropriate drawings.

The great wheel requires a blank slightly more than 3.374" in diameter and 5/16" thick. The first operation on the lathe is to bore the central hole which must be a close running fit on the 0.413" diameter of the barrel arbor. A good way to obtain this is, beforehand, to make up a special D reamer in silver steel suitably hardened, tempered and honed.

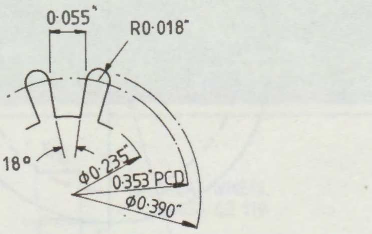
An arbor suitable for mounting the blank in the wheel cutting engine is turned using a lathe collet rather than a chuck. With the arbor still in the lathe, the wheel blank is mounted and its outside diameter is skimmed to 3.374".

Having made the spindle of my wheel engine to replicate the nose of the Myford headstock spindle, it was for me now simply a matter of transferring the collet complete with mandrel and wheel blank. I have perhaps laboured this point, but it is vital by whatever means to maintain concentricity so as to get even tooth depths around the wheel – and this becomes more critical with the smaller wheels.

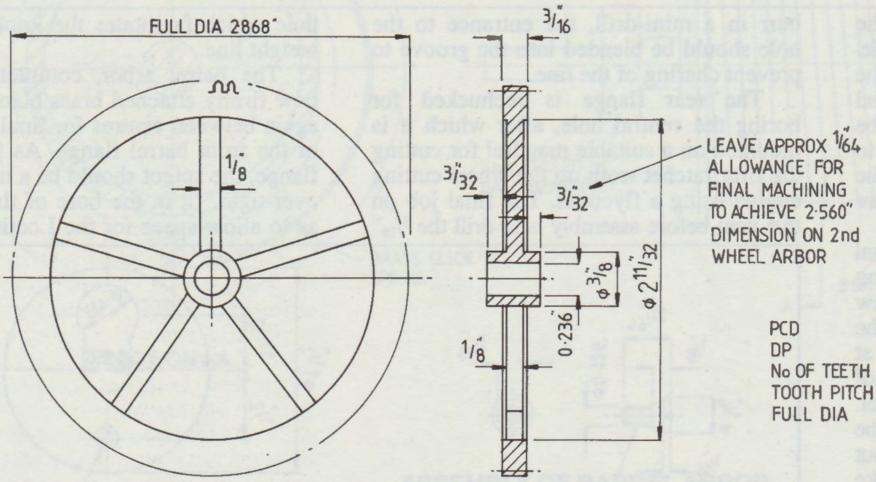
When the finished wheel is slipped on to the barrel arbor, it should be found that the wheel slightly overlaps the groove for the slip washer. Mounting the arbor once more between centres, the rear face of the



SECOND WHEEL ARBOR
1 off Silver Steel

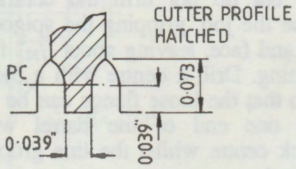


PINION TOOTH FORM DETAIL


FULL DIA 2868"
1/8"
3/16"
3/32"
3/32"
LEAVE APPROX 1/64" ALLOWANCE FOR FINAL MACHINING TO ACHIEVE 2·560" DIMENSION ON 2nd WHEEL ARBOR
ϕ 3/8"
ϕ 2 11/32"
0·236"
1/8"

PCD	2·800"
DP	40
No OF TEETH	112
TOOTH PITCH	0·0785"
FULL DIA	2·868"

SECOND WHEEL
1 off Brass (CZ119)



DETAIL OF TOOTH FORM

barrel ratchet is skimmed carefully with a very sharply pointed tool until, with the great wheel in place, the previously prepared slip washer can be just slid into its groove. The aim is to allow the wheel to rotate with relation to the barrel but to keep it close up to the face of the barrel ratchet with no excess play.

To finish the assembly it is now only necessary to make and fit the click and click spring and to secure the slip washer with a 6BA countersunk screw. The click spring is cut roughly to shape from a sheet of $^{3}/_{32}$" brass and hammered to work harden it. The blade of the spring is draw-filed and the whole finished with fine abrasive cloth. After forming the curvature around a suitable round object, the spring is fixed to the great wheel with an 8BA countersunk screw; not forgetting the steady pin. The details for making and fitting of the click and its screw should be clear from the drawing.

THE SECOND WHEEL & PINION

The arbor, although carried on ballraces, is made in silver steel since the integral 34 DP pinion will have to be hardened and tempered. Again, turning should be between centres because of the accuracy and alignment required for the two ends. The taper brings the diameter down to the bottom of the leaves of the pinion whilst not detracting too much from the strength of the arbor itself.

Initially, about $^{1}/_{4}$" extra needs to be left on the right hand end to provide sufficient material for gripping in the pinion cutting set-up – see the photograph opposite. At this stage, this end is left about 0.010" oversize on its final diameter.

In cutting the pinion, proceed with small cuts in turn around all twelve leaves before advancing the cutter to repeat the procedure, and so on. Any attempt to cut between each leaf fully, before moving to the next, will result in leaves being pushed over in the direction of the leaves cut previously because of the imbalance of material on each side of the cutter. A slow cutting speed with cutting lubricant is also advisable.

After completing the milling of the pinion leaves, the excess length of the arbor is cut off and it is then necessary to face off and replace the centre drilling prior to finish machining to diameter.

With both ends of the arbor confirmed to be a light push fit into their respective ballraces the pinion is ready to be hardened by heating to cherry red before quenching in oil. To prevent distortion it is essential to heat the pinion evenly.

To do this, the arbor was held, at the end remote from the pinion, in the chuck of a slowly rotating pillar drill whilst the pinion was heated by a fine flame. When the required temperature was reached and the flame removed, a container of oil was placed underneath and the still rotating arbor was fed into it.

After polishing the pinion leaves with progressively finer grades of abrasive powder and oil, applied with the end of a suitably sharpened strip of wood, the pinion was tempered using a similar technique, aiming for dark straw before quenching.

The final polishing of the pinion is undertaken, again using the strip of wood with abrasive powder and oil, the end of the wood rapidly adapting itself to the required shape as it is pushed back and forth between the leaves. This procedure is described on page 121 of Donald de Carle's book.

The second wheel is shown opposite. By undercutting and forming spokes, the mass of this component is reduced considerably but because the wheel will be highly loaded, the tooth width is left at $^{3}/_{16}$". The central boss fixes the axial position of the wheel, ensuring that it does not foul the great wheels and it also locates the rear 6mm ball race. Note the additional $^{1}/_{64}$" final machining allowance on the rearmost face of this boss.

The bore of the wheel needs to be a good sliding fit on the end of the arbor so that it can be secured with Loctite retainer in its position hard up to the pinion. After the Loctite has cured, the face of the boss is skimmed to obtain the toleranced 2.560" dimension stipulated on the drawing to ensure that the ball races are left with a small amount of end float.

To be continued.

THE KERR STUART WREN CLASS 0-4-0 LOCOMOTIVE IN 16mm SCALE

Continued from page 108

hole in the gas valve base.

The top part of the gas valve body is made from $^{3}/_{8}$" diameter brass rod which is gripped in the chuck with 25mm projecting. Face, centre drill and drill a 12mm deep hole with a No. 55 drill. Replace the drill with a No. 21 (4mm) and drill 6mm deep. Replace this drill with a $^{3}/_{16}$" × 40 tpi plug tap and tap the hole to the base, turning over the lathe chuck again by hand. Replace the tap with a 10BA second cut tap (a two flute machine tap is best if you have one) and, very carefully, form a 10BA thread in the central small hole to a depth of approximately 6mm.

With the valve top still in the lathe chuck, turn down the projecting body for 10mm to an outside diameter of 6.5mm and part it off at 16.5mm long. Reverse the valve top in the chuck and turn down a 5mm length to an outside diameter of $^{3}/_{16}$". Use a die to thread this part of the valve top $^{3}/_{16}$" × 40 tpi.

Position the hole for the exit of the gas as shown on the drawing, at an angle of approximately 5 degrees to the horizontal. The recess for the remaining gas outlet adaptor is formed by using a $^{1}/_{8}$" drill or slot drill, as described for the valve base. This adaptor may also need to be shortened to the length shown on the drawing, then inserted into the recess and silver soldered into position. After pickling the assembly, use a No. 55 drill to break through the remaining material to connect the hole in the adaptor with the central hole in the assembly. Re-grip the gas valve top and open out the central hole below the flange with a No. 43 drill until it connects with the gas hole coming in from the side. This hole will be approximately 8mm deep but do check from the valve itself.

The brake standard is the next item to be made. After forming the threaded end of the standard, use a round nose lathe tool to reduce the diameter and form the radii on each end of the smaller diameter of the standard.

Make the brake handle by cross-drilling the brake shaft body before drilling and tapping the body on the lathe for the brake shaft itself. The handle starts as a 22mm length of stainless steel wire and, for appearance, one end of the wire should be rounded and bent to form the upstanding part of the handle. For comfort, this should be about 5mm long.

Trial assemble the gas valve. Take a 6" length of PTFE tape twisted into a rope and then twist the rope on itself to give a double strand. A few millimetres above the needle point, wrap five or six turns around the needle. Start threading the needle into the top fitting and then compress the PTFE packing by screwing the brake standard on to the top fitting. Put a twist of PTFE tape around the $^{3}/_{16}$" × 40 tpi thread and screw the top into the base fitting of the valve. Fit the handle to the needle (brake shaft) and thread it in until it cannot go any further. The needle should now be firmly seated in the tiny hole in the gas valve base. If you blow through the gas inlet pipe, you should feel that the valve is sealed. As you turn the needle valve, so you should feel your breath start to pass through the valve.

The gas valve can now be disassembled for putting into the locomotive. If the gap between the bottom of the brake column and the top fitting is too great for your liking, do not remove the excess thread length just yet – this can be done when you have tested the boiler and the gas burner, etc.

Fit the gas control valve to the left hand cab bunker floor, putting a fibre washer between the flange on the brake column and the floor. The thread projecting below the floor should be wrapped in a turn or two of PTFE tape and the bottom fitting screwed on to it. Both the inlet and the outlet pipes should face forwards.

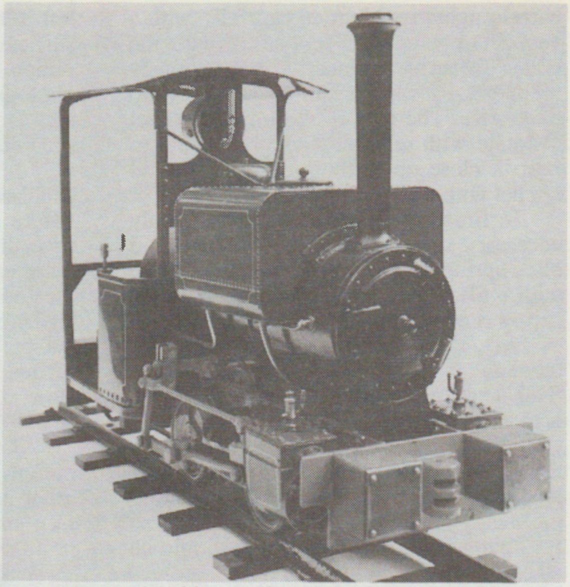
The gas pipe runs forward from the gas tank, turns back on itself having gone over the top of the Hackworth shaft, then runs down the side of the left hand frame through the cut-out in the left cab bunker floor and is joined to the bottom of the gas control valve with a nut. When the gas pipe has been fitted, put a squirt of gas into the tank and, outside the workshop, check that your valve turns the gas on and off. Check for leaks with soapy water and, if any of the joints leak, disassemble and refit using a jointing compound. Check for leaks where the brake shaft emerges from its column and cure a leak here by further compressing the packing between the column and the gas valve top.

Next time we will begin making the Hackworth bearings.

To be continued.

THE KERR STUART WREN CLASS 0-4-0 LOCOMOTIVE IN 16mm SCALE

by Malcolm Wright



Part Nine

The gas control valve is made from seven components, two of which are those 3/16" × 40 tpi male adaptors made previously.

The key component of the gas valve is the control needle. This is made from 1/16" (nominal) stainless steel rod. Cut a length of rod 65mm long and file the ends square. Grip the rod in the 3-jaw chuck with approximately 1/4" of the rod projecting from the jaws of the chuck. After making sure that there is nothing on which to catch your hand, and with the lathe at its fastest speed, take a smooth cut flat file and taper the end of the rod to approximately 15 degrees by eye. This should give you a needle point just over 5/32" (4mm) long. The dimensions are not critical, but the needle point **must** have a mirror finish. This can be achieved by burnishing the filed surface of the point with a piece of hard polished steel against the projecting surface of the needle as it turns in the lathe until it is completely shiny and smooth.

Having made the needle point, re-grip the needle with approximately 30mm projecting from the chuck, coat the stainless steel with a cutting compound and run a 10BA die along the rod to leave approximately 14mm of thread.

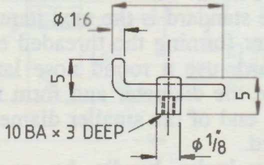
The control valve body itself has two 'working' parts – the base and the top – both of which should be made accurately to the drawing.

Commence machining the body of the gas valve base by gripping a piece of 5/16" A/F hexagon brass in the chuck with about 20mm projecting from the chuck. Face, centre drill and then very carefully drill a hole 11mm deep with a number 66 drill, withdrawing the drill frequently to clear the flutes of chips. Replace the drill with a No. 21 drill (4mm) and drill to a depth of 5mm. Again, replace the drill with a 3/16" × 40 tpi plug tap and, working the chuck backwards and forwards by hand, tap this hole to the bottom. The tap should now be replaced with a 5/32" slot drill to increase the depth of the hole by 1mm, then part off the piece 13mm long. For appearances' sake, bevel both ends of the hexagon base with either a lathe tool or a smooth file.

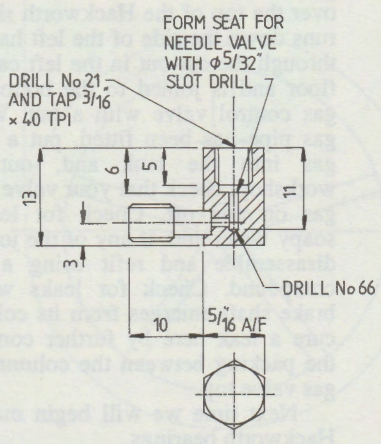
Position the hole for the gas inlet on one face of the hexagon as shown on the drawing, using a 1/8" drill or a slot drill to form a recess approximately 1mm deep to accept the shank of the 3/16" × 40 tpi adaptor. It may be necessary to shorten the adaptor to the length shown on the drawing, then it is pushed into the recess and silver soldered into position.

After pickling the assembly, drill a No. 55 hole to break through the remaining material of the base to connect the hole in the adaptor with the central

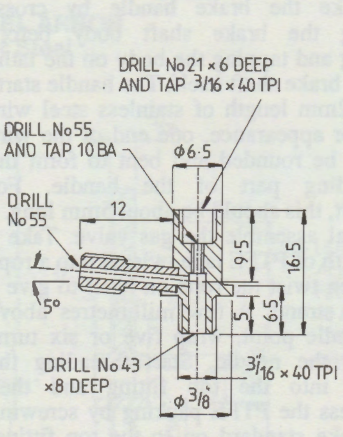
Continued on page 107



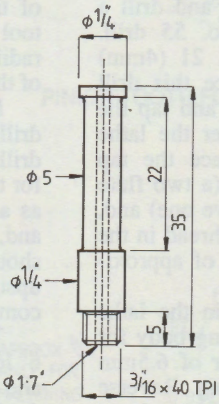
BRAKE HANDLE
1 off Brass & Stainless Steel


FORM SEAT FOR NEEDLE VALVE WITH ϕ 5/32" SLOT DRILL
DRILL No 21 AND TAP 3/16" × 40 TPI
13
6
5
11
3
DRILL No 66
10
5/16" A/F

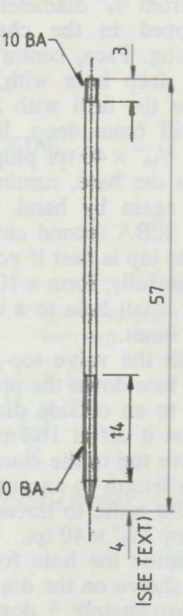
GAS VALVE
(BOTTOM FITTING)
1 off Brass



GAS VALVE
(TOP FITTING)
1 off Brass



BRAKE COLUMN
1 off Brass



NEEDLE
(BRAKE SHAFT)
1 off
Stainless Steel (ϕ 1/16")

A NEW TRACK FOR THE SOUTH DURHAM SOCIETY OF MODEL ENGINEERS

by Bill Oakes

The opening ceremony, despite the rain. From left to right, John Gladden on the locomotive, vice chairman Mr Les Barron, club chairman Ron Ransome, Mr John Lawrie, chairman of the Community Association, and club secretary Brian Owens.

In 1969 the South Durham Society of Model Engineers began life as a club based at Hurworth Grange Community Centre in Darlington, Co. Durham. Indeed, the society was the first organisation to affiliate itself to the community association based at the Grange. One of the club's early tasks was to commence building a track in the grounds and, for a newly formed club, this was quite a task. Work was often halted until sufficient finance was available to purchase the next load of materials.

The track was finally completed and gave good service for many years. Twenty-five years later, the club contemplated the replacement of the track with something offering a little more to the club members. With the regular annual bookings for the portable track, club finances were in a much healthier state than when the original track was built and, whilst a considerable capital outlay would be required, at least work would not be halted for lack of funds!

At a special meeting on the 12th January 1993 the decision was taken to replace the track and the first concrete pillars were cast in May 1993. By September the first lengths of point rodding for the track were rolled and welded.

Site work proper started on the 17th May 1994 and demolition of the old track took place in August of that year. Construction took two years, but the club was only without a full circuit of track for twenty months.

On the 4th May 1997 the track was officially opened by Mr John Lawrie, chairman of the Hurworth Grange Community Association.

This special occasion for the club started early. From 7.00am members had been busy preparing for the day. It was raining quite heavily as the group of workers erected the marquee, but by 9.30 the tent was erected, filled with tables and chairs and tea-making equipment. The rain had eased off and the workers took a short break to enjoy bacon sandwiches which had been prepared on a barbecue. By 10.30, steam was being raised as drivers prepared their charges for the opening cavalcade.

The society had also constructed seven new passenger bogie cars which were now gracing the new track, resplendent in their new livery of red and cream. Immediately after his speech, the chairman of the community association boarded the train for the first 'official' trip. At the regulator of one of his locomotives was John Gladden, who has been a member of the club since its inception.

The official train was followed by a cavalcade of eight locomotives, each sounding their whistles as they departed amongst much applause from the crowd which had gathered. It was a particularly satisfying moment for the club members at the culmination of their efforts over the preceding 2½ years.

Despite the wet start to the day, the rain held off and the sun even made an appearance as public running got under way. A steady supply of passengers were hauled by a variety of locomotives during the afternoon, ranging from small tank engines to express passenger locomotives.

Members from six model engineering societies brought locomotives along and the steaming bays were busy for most of the day. In addition to the events on the track, the club also provided a display of models in a marquee adjacent to the station. This display included some fine examples of road and stationary engines, as well as many part finished models.

Continued on page 111

Just some of the crowd watching the cavalcade of locomotives following the official opening train.

The steaming bays of the new track were busy as the members and visitors prepared their locomotives.

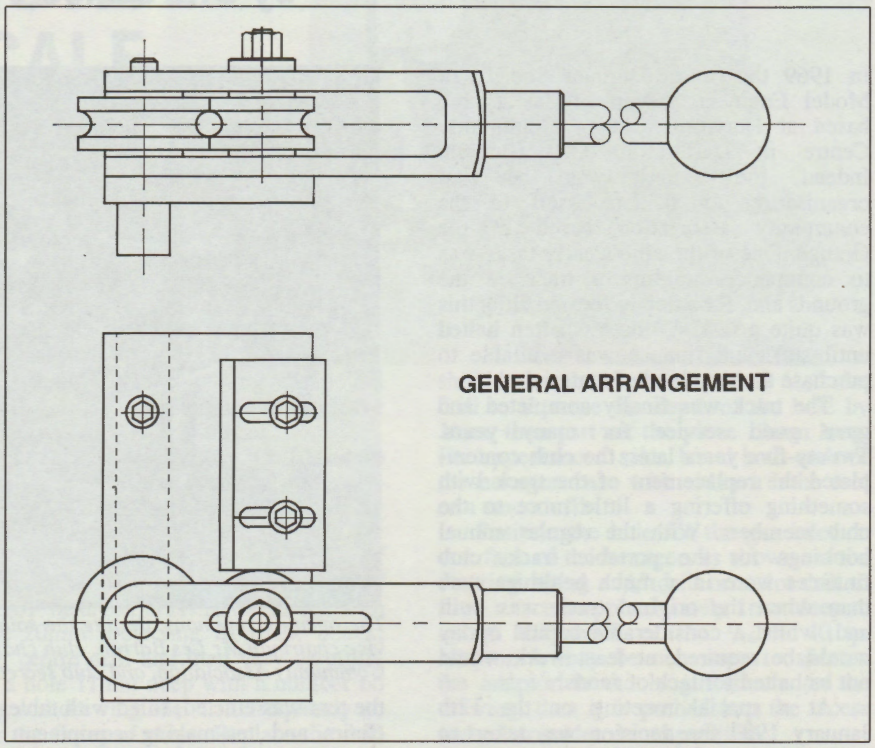
A PIPE BENDING TOOL

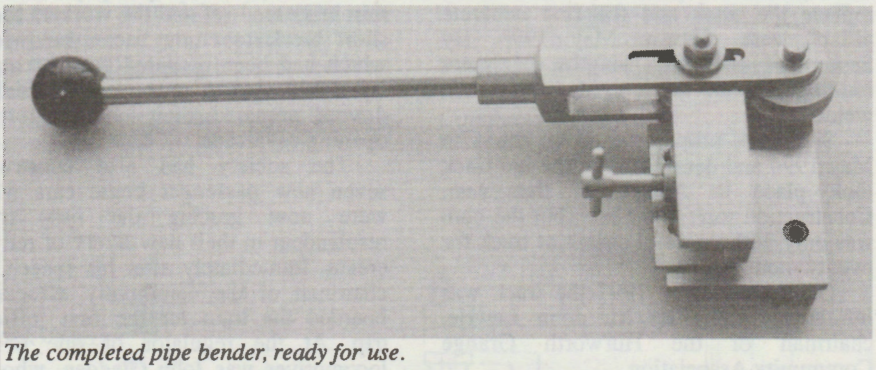
Designed and described by Torus

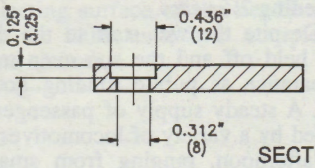
I had been meaning to build a tube bending tool for a long time but I had usually been able to 'make do', thus avoiding the problem. Finally I came to some serious tube bending and I had no option but to build a proper pipe bender. While I was about it, it seemed sensible to make the tool as versatile as possible. Once you have such a device, you wonder how you ever managed before – the work becomes so easy. After the expenditure of only twelve hours to construct the tool, lovely smooth bends take just seconds.

There are some ready made pipe benders available on the market at quite reasonable cost, but these are generally restricted to 1/4", 3/8" and 1/2" diameter tubes and all bends have to be to one radius only. I needed a bender to accommodate pipe diameters from 1/16" to 3/8" and to a wide variety of radii.

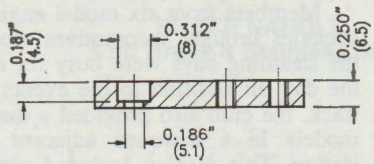
All of the pipe benders which I had seen seem to follow a fairly standard method – the tube is trapped between two semi-circular formers, one former passes around the circumference of the other former forcing the tube to the shape required. As a variation on a theme, one type of bender has both formers of circular shape, the other version has one circular and one straight. As I prefer turning, I made both my formers of the circular type. It would not be difficult to adapt the design to use a straight former if you wish. My pipe bender will only cope with tube diameters of up to 3/8" (10mm) but again, adaptation for larger tube diameters would be possible if the design were to be 'beefed up' a bit.


GENERAL ARRANGEMENT

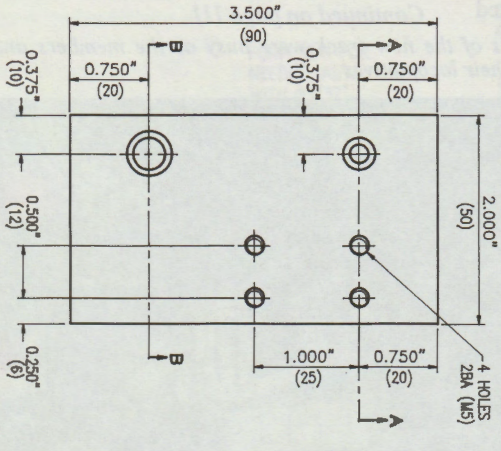

The completed pipe bender, ready for use.



SECTION BB



SECTION AA



BASE
1 off Mild Steel

A fence, which also carries a clamp, is used to keep the straight section of tube in check. On the larger diameter tubes, there is a tendency for the former to pull the tube forward as it forms the bend, but the clamp stops this. Care needs to be taken when bending any tube as it is possible to squash the straight section of tube, so if possible a length of solid rod should be pushed into the straight section of the tube. Alternatively, a clamp that fits around the tube can be adopted. This would bear on the end of the fence.

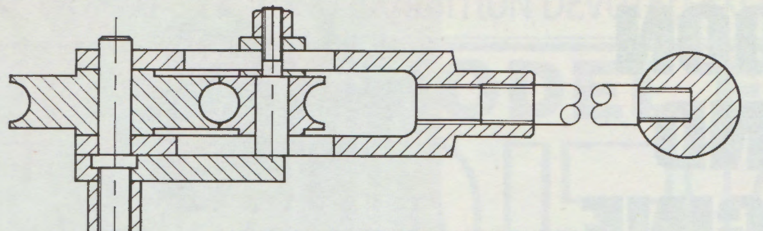
It also helps, when bending the larger diameter tubes, to anneal the material first, presuming that the material of the tube is copper.

The design for the pipe bender consists of a flat metal base with a block underneath that clamps in the bench vice. A spindle, which also carries a former, carries a fork which pivots around the spindle. Within the fork is another spindle carrying the other former. The spindle within the fork is adjustable along the fork to accommodate different diameters of former. The fence, through a range of slots, is also adjustable. Apart from the different formers that will be required – and these can be made as the need arises – there are only fourteen parts to be made. My photograph above shows the completed tool.

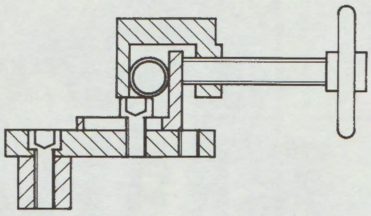
The base of the tool consists of a mild steel plate 3 1/2" × 2" × 1/4" (90 × 50 × 6.5mm). File or mill all the edges square and mount in the machine vice on the milling machine. Using co-ordinates, centre drill all the holes, then open out to the diameters required, counter-boring where required. The tapped holes can be started while the job is set up on the mill and finished by hand afterwards – this will ensure that the threads are truly vertical. Break all the sharp edges and clean up all over, draw-filing to give a fine finish. The base could be decoratively finished by engine turning.

The base clamping block is simply a length of 1/2" (12mm) square mild steel bar 3 1/2" (90mm) long. This is drilled and tapped twice – one hole 2BA (M5), the other 5/16" × 26 tpi (M8 × 1mm pitch). I have used a fine thread for the larger hole as the spindle is subject to considerable force when bending the larger diameter tubes and the fine thread gives a bigger core diameter to resist the greater forces.

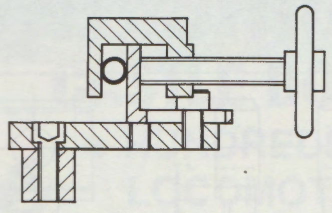
To be continued.



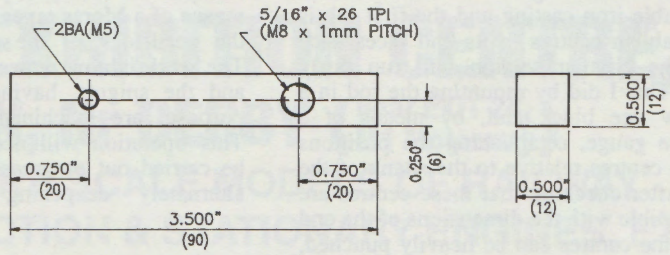
SECTION THROUGH PIPE BENDER AT PIVOT



SECTION THROUGH CLAMP SHOWING SET-UP FOR 1" RADIUS BEND IN Ø 3/8" TUBE



SECTION THROUGH CLAMP SHOWING SET-UP FOR 1/2" RADIUS BEND IN Ø 1/4" TUBE



BASE CLAMPING PIECE
1 off Mild Steel

A NEW TRACK FOR SOUTH DURHAM SME

Continued from page 109

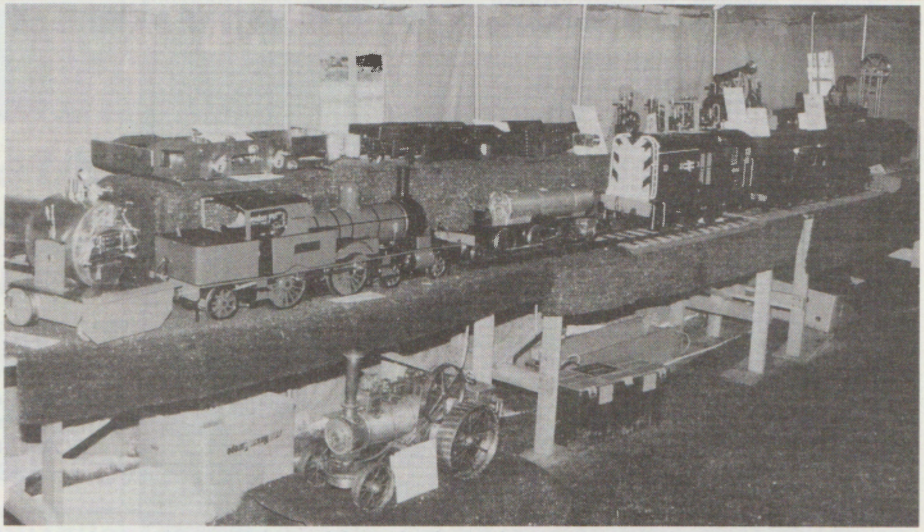
Unfortunately, by 4.30pm the rain returned and the passengers began to disperse.

The track is 718 ft long with 3½", 5" and 7¼" gauges available. Constructed on concrete pillars, the track is formed of black steel bar, welded to steel sleepers which are in turn screwed to wooden sleepers. The straight and curved sections of the track were prefabricated in the club's workshop, while transition sections of the track were fabricated on site to ensure a smooth blending of the different radii. Several joints are fitted with special fishplates to allow expansion in hot weather.

A swing bridge provides access to the centre of the track and a turntable allows trains to enter the steaming bays. Both of these access points are interlocked with the colour light signalling system. A second turntable behind the station platform serves the five steaming bays.

The station itself is a slabbed area with fabricated tubular steel fencing, behind which passengers are able to view activity in the steaming bays whilst waiting for the next train. All structures have to resist vandalism, so very robust fabrications have all moving parts either padlocked or removable.

A journey around the line begins at the station, then a gentle climb crosses the level turntable stretch and almost immediately the swing bridge leads into the first right hand curve before the summit is gained just beyond the site of the old station. A brief section of level track is followed by another right hand curve which begins the descent through woodland and a small cutting as the train passes to the rear of some gardens. Drivers need to keep a sharp lookout here as the sound of an approaching locomotive often brings small children or animals running to see the trains. The track then levels out very briefly before the next right hand curve which begins the final climb back to the station.



A general view of some of the models on display under canvas.

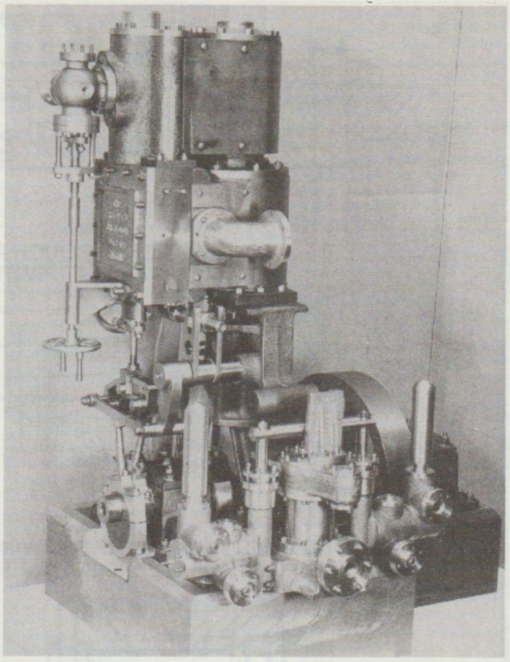
It is always difficult to mention individuals by name lest someone is missed out, especially as the track is a real team effort by the club. However, without some individuals' enthusiasm, effort, encouragement, resourcefulness and motivation, the project would not have even left the drawing board. They are, in no particular order, the club's late chairman, Dave Walton, track marshall (now chairman) Ron Ransome, the present track marshall Geoff Fearnley, 'Captain Crowbar' Tom Syms and Peter Lanagan. Others who gave time, effort or materials to help the project include Eric Ridler, secretary Brian Owens, vice chairman Les Barron, Cliff Barratt and Ken Gibbon.

The Stephenson Memorial Locomotive Efficiency Trials held in August 1997 was just the first of many events hosted by the very active society, which occupies several rooms in the cellar of the Grange, including a meeting room and library as well as a comprehensively appointed workshop with two lathes, two milling machines, pillar drill, shaper, power hacksaw and various other machinery, all of which are available for the members' use.

For further information about the society or track, contact the secretary, Brian Owens, on 01325 721503.

THE SHELDON COMPOUND STEAM ENGINE

John P Bertinat

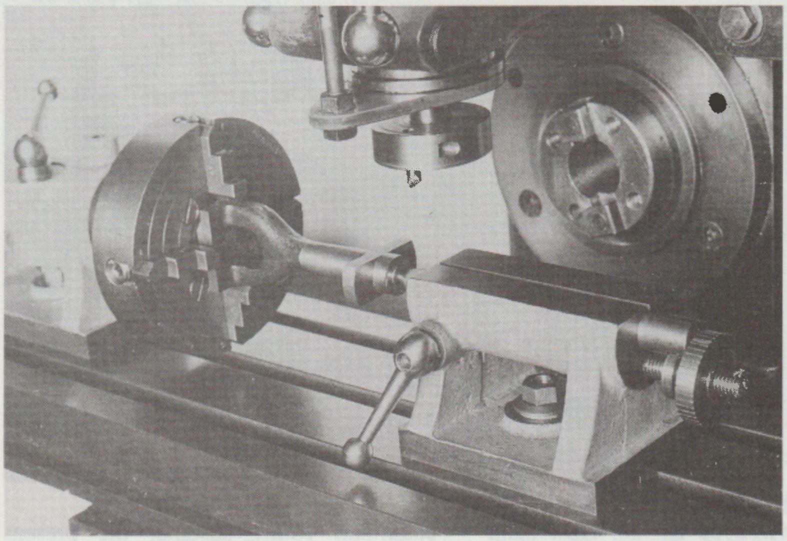


Part Sixteen

Connecting Rod

The connecting rod is available as a malleable iron casting and the first job is to establish centres in its end faces such that the circular section will run fairly truly. This I did by mounting the rod in a narrow vee block and, by means of a surface gauge, establishing the positions of the centres relative to the shank of the rod. After checking that these centres are compatible with the dimensions of the end pads, the centres can be heavily punched, the work checked for true running by spinning between centres and then centre drilled.

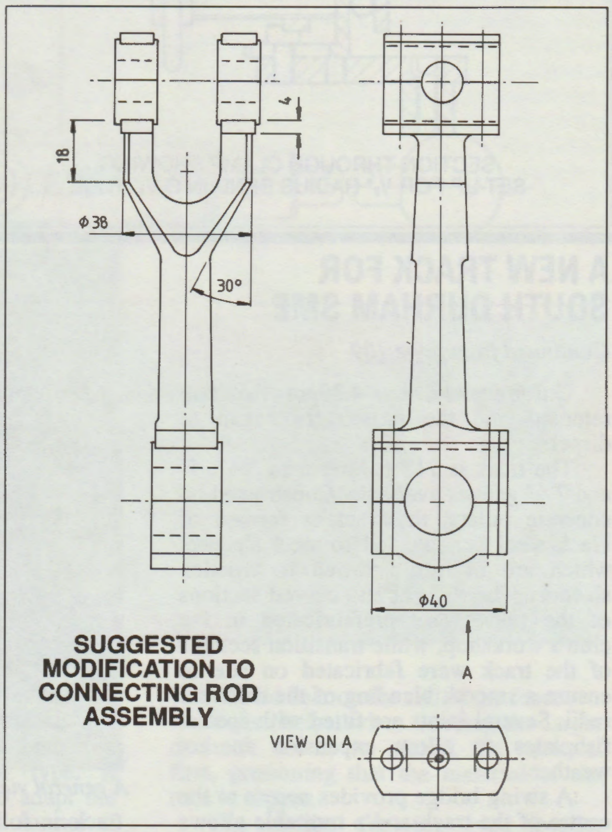
With the rod now mounted between centres, the end face of the big end 'palm' is machined, leaving at this stage a short spigot 18mm diameter (this can be seen in the photograph above) to serve as a witness when milling the flat sides of the palm. The shank of the rod is partially turned at this setting, leaving a section adjacent to the big end parallel at this stage for the future employment of a fixed steady. The work is then turned end for end in the lathe and the small end partially machined, leaving a 40mm diameter spigot to serve as a witness for the extreme width of the small end forks.



Flycutting the sides of the big end palm of the connecting rod.

The rod is then transferred to the milling machine and, in my case, using a home made dividing head which accepts Myford chucks, the flat edges of both ends of the rod are machined, using the witness spigots to ensure that all dimensions are correct relative to the axis of the rod. Incidentally, the work was centred in the four-jaw chuck by means of a Morse taper centre fitted in the headstock of the dividing head. The work is now returned to the lathe and the spigots, having served their purpose, are machined off. This operation will need to be carried out progressively, alternately deepening the centre drilling, supporting the work with a half centre and removing part of the spigot with a knife tool; a fixed steady may be used to give additional support if found necessary. Both centres and the parallel section of the rod should be retained until the big end bearings are made and fitted. note that the drawing gives the thickness of the 'palms' on the small end of the rod as 3mm which may be considered to be slightly on the small side; I managed to increase mine to almost 4.5mm, slightly increasing the length of the connecting rod in the process. This increase compensated for the extra material I left on the mounting pad of the bottom cylinder cover.

The castings for the big and small end bearings are now separated, their mating faces machined flat and soldered together. The edges of the big end brasses are squared up in a four-jaw chuck, leaving them oversize for the time being and then, gripping squarely and centrally by the now machined edges and making sure that the joint face is at centre height, the bearing is drilled and bored for the crankpin. The surface is then faced and the work reversed in the chuck – or *carefully* mounted on a mandrel – for facing the reverse side, bringing the width to 20mm to fit between the crank webs. If the mandrel method is used, it will be advisable to fit clamp over the work to reinforce the soldered joint, failure of which at this point would be a disaster. Next the holes for the big end bolts are marked out on the top face (ie. facing the connecting rod) and the work transferred to a machine vice in the vertical miller for



SUGGESTED MODIFICATION TO CONNECTING ROD ASSEMBLY

THE WORLD'S LEADING EXHIBITION DEVOTED EXCLUSIVELY TO MODEL ENGINEERING

Midlands MODEL ENGINEERING EXHIBITION '97

18 — 25 OCTOBER 1997

at **INTERNATIONAL EXHIBITION CENTRE,**
CASTLE DONINGTON, Nr DERBY (near EXIT 24, M1 Motorway)

See

- HUNDREDS OF SUPERB SCALE MODELS OF RAILWAY LOCOMOTIVES, TRACTION & STATIONARY ENGINES, ETC.
- CLUB DISPLAYS BY OVER *FORTY* SOCIETIES

The ENGINEERING in MINIATURE WORKSHOP

staffed by some of the UK's leading experts

WORKING LIVE STEAM EXHIBITION LAYOUTS

presented by **THE GAUGE 1 MODEL RAILWAY ASSOCIATION & THE ASSOCIATION OF 16mm NARROW GAUGE MODELLERS**

Plus **A WORKING MINIATURE GOODS *MARSHALLING YARD***

presented by the Ground Level 5" Main Line Association

MODEL STEAM ROAD VEHICLES

See MODEL TRACTION ENGINES, STEAM WAGONS, ETC IN ACTION

OPEN:

10.30am-6.00 DAILY
(final day 5.00pm)
LATE NIGHT THURSDAY
TILL 8.00pm

ADMISSION:

ADULTS £6.50
CHILDREN £4.00
SENIOR CITIZENS £5.50
FAMILY TICKETS (2 Adults 2 Children) £17.50

All the UK's leading Suppliers will be present

- Axminster Power Tools
- Beugler Pinstriping Tools
- Blackgates Engineering
- Bruce Engineering
- Braithwaite MT Rebuild
- BW Electronics
- Chester UK Ltd
- Chronos Ltd
- College Engineering Supply
- Diana Carney Locomotive Nameplates
- EKP Supplies
- Emco
- John Ellis (Boilers)
- Frhei Drills
- Excel Machine Tools
- Greenwood Tools
- R S Hammond & Sons
- Hegner UK
- Home & Workshop Machinery
- Jaymac (Derby) Ltd
- Kirjeng Model Engineering Services
- LA Services Ltd
- Langdon (London) Ltd
- Live Steam Models
- Myford Ltd
- Peatol Machine Tools
- Pheonix Paint Company
- Power Capacitors Ltd
- Proops Bros Ltd
- A J Reeves & Co (Birmingham) Ltd
- R D & G Tools of Haworth
- Rexon Ltd
- Rotagrip Ltd
- Shesto Ltd
- Starkie & Starkie Ltd
- TEE Publishing
- Tony Green Steam Models
- Toolstop (Bracknell)
- Tracy Tools Ltd
- Warren Machine Tools
- Winson Engineering Ltd

PLUS OTHERS YET TO BE ANNOUNCED

Exhibition organised by
Meridienne Exhibitions Ltd, The Fosse, Fosse Way, Leamington Spa CV31 1XN. Tel: 01926 614101 Fax: 01926 614293

Midlands

MODEL ENGINEERING EXHIBITION

International Exhibition Centre, Castle Donington, near Derby

18th-25th October 1997

BOOK NOW

SAVE 10% ON ADMISSION CHARGES BY BOOKING IN ADVANCE

Make the most of your time at the Exhibition by having **Advance Tickets.** If when you arrive there are long queues, you will find that as an Advance Ticket Holder you can gain almost immediate entry to the Exhibition thus avoiding any frustrating queueing. Please note advance tickets are not available after 10th October 1997.

WHY NOT ORGANISE A PARTY VISIT?

Parties make extra savings! In addition to the 10% Discount we'll give you a FREE ticket for every ten tickets booked!

Make it a family day out! While you visit the Exhibition your family can enjoy a day out in Derby or Nottingham. It's a great chance to do some early Christmas shopping. Not enough members to fill a coach? Why not organise a joint trip either with another club in your area or one en route. Alternatively advertise the spare seats and sell them to people wanting a day trip to go Christmas shopping (or talk to your local coach operator – if you guarantee some seats they'll sell the rest).

PARTY / ADVANCE BOOKINGS APPLICATION FORM

Please complete and return to:

The Exhibition Manager, Meridienne Exhibitions Ltd, The Fosse, Fosse Way, Leamington Spa, Warks. CV31 1XN or alternatively use our Credit Card Hotline 01926 614101, fax 01926 614293

ADVANCE TICKETS ARE NOT AVAILABLE AFTER 10th OCTOBER 1997

Please supply the following tickets:

	Family Tickets (admits two Adults and two Children)	at £15.75 each	
	Adults	at £5.85 each	
	Senior Citizens	at £4.95 each	
	Children	at £3.60 each	
		TOTAL	

(All admission charges include value added tax)

I/We enclose cheque/P.O./Cash/Draft or for the amount stated made payable to **Meridienne Exhibitions Ltd,** *together with a S.A.E.* for the return of the tickets.

If you wish to pay by credit card please write your number opposite.

MasterCard

VISA

Card Expiry Date ....

ALL ORDERS MUST BE SIGNED Signature ....

Please forward tickets to: BLOCK CAPITALS PLEASE

Name ....

Address ....

....

Postcode .... Telephone No. ....

We welcome your assistance in publicising the Exhibition. Publicity material is available on request. Please state quantity reqd.:

POSTERS ☐ .... HANDBILLS ☐ .... INFORMATION LEAFLETS ☐ .... CAR STICKERS ☐ ....

Midlands
MODEL ENGINEERING EXHIBITION

MODEL ENGINEERING 97

Entry Form

International Exhibition Centre, Castle Donington, near Derby

18th-25th October 1997

You are cordially invited to enter your model/s in our 1997 Midlands Model Engineering Exhibition to be held at the International Exhibition Centre, Castle Donington, near Derby. All exhibitors will receive a specially designed commemorative plaque and a diploma certifying that their model was exhibited at the exhibition. Whilst the exhibition is in progress all models will be fully insured and wherever possible all exhibits will be directly linked to wired alarm systems. Adequate barriers will protect all exhibits and night security will be maintained.

EXHIBITION CLASSES A total of sixteen classes exist as listed below. Furthermore, these are divided into two sections: **Competition** which will be judged by acknowledged experts and cups, etc. awarded and **Display** where exhibitors just wishing to display their work, finished or unfinished, may do so for the enjoyment of visitors.

Class 1	Locomotives – up to and including gauge 1
Class 2	Locomotives – 2½" and 3½" gauges
Class 3	Locomotives – 5" & 7¼" gauge and above
Class 4	Rolling Stock, etc., any gauge
Class 5	Stationary Engines
Class 6	Steam Road Vehicles
Class 7	Machine Tools and Workshop Equipment
Class 8	Petrol & Diesel IC Engines
Class 9	Horological and Scientific
Class 10	Marine Models – Scale (over 50% scratch built)
Class 11	Marine Models – Kit (standard or modified)
Class 12	Model Horse Drawn Vehicles
Class 13	Scale Aircraft Models
Class 14	Young Engineers Award (under 20 yrs old)
Class 15	Miscellaneous
Class 16	Hot Air Engines

IMPORTANT: THERE ARE NO COMPETITION ENTRY CHARGES AND CASH PRIZES ARE AWARDED WHERE APPLICABLE

ENTRY FORM: PLEASE COMPLETE ALL SECTIONS AND RETURN TO:
The Exhibition Manager, Meridienne Exhibitions Ltd, The Fosse, Fosse Way, Leamington Spa, Warwickshire CV31 1XN.
Tel: 01926 614101 Fax: 01926 614293

COMPETITOR'S NAME ....

ADDRESS ....

....

Occupation .... Telephone No. (Day)...................................... (Eve) ....

ONE ENTRY PER FORM PLEASE. PHOTOCOPIES ARE ACCEPTABLE

EXHIBIT (Please give detailed description): .... Scale/gauge* ....

....

....

CLASS ENTERED ....

PLEASE STATE WHETHER – COMPETITION ☐ DISPLAY ☐ *Please delete as required

Origin of design ....

Overall size with base if applicable .... Weight .... Value ....

Details of workshop facilities used in construction ....

....

Details of any work on the exhibit not undertaken by you, or not of your own manufacture (excl. commercial castings, etc.) ....

....

Will you be delivering the model to:* Exhibition ☐ Leamington Spa office ☐

Has the model been entered in any other Exhibition .... If Yes, please state which ....

Any further information to assist compilation of the Exhibition Guide ....

....

Has a photograph been enclosed .... This is for publicity and may be used in the Exhibition Guide. Photographs will be returned after use.

If a member of a Model Engineering or other Society, please state which ....

---

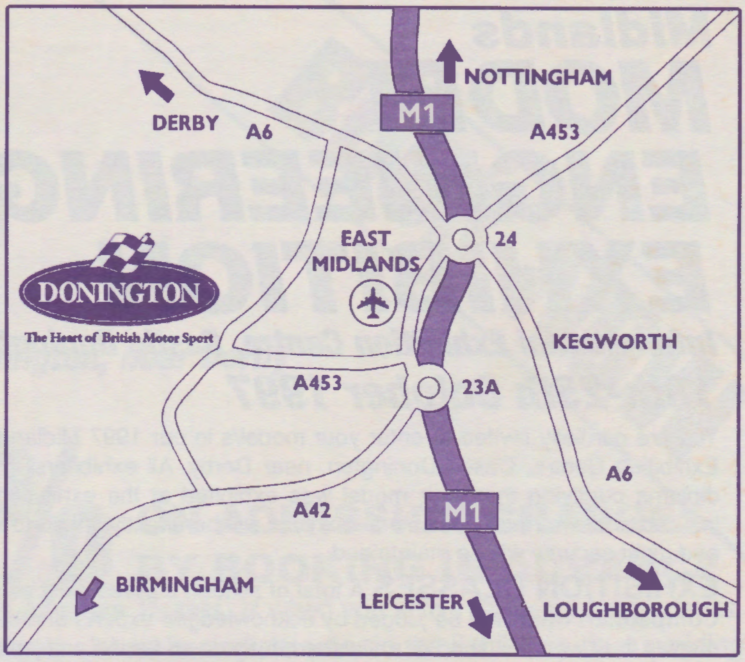
* All exhibitors will receive an exhibitors pass (not transferable) and official receipt for their exhibit upon delivery either at the exhibition or at the office of Meridienne Exhibitions Ltd. Exhibits should be delivered to the exhibition from 2.00 pm until 8.00 pm on Friday 17th October 1997 or to our offices from Monday 13th October onwards by arrangement and can be collected from 5.30 pm until 8.00 pm on Saturday 25th October or from 8.00 am until 10.00 am on Sunday 27th October 1997. Receipts will be given to all owners and must be presented to claim your model at the end of the exhibition. The system for collection of models has been simplified to ensure models can be collected by their owners with the minimum of delay.

IT WOULD BE OF ASSISTANCE IF THIS ENTRY FORM COULD BE COMPLETED AND RETURNED BEFORE 22nd SEPTEMBER 1997

It may be possible to arrange transportation of exhibits for those who live a considerable distance from Castle Donington. Please contact the Exhibits Secretary for further information.

The Midlands
MODEL ENGINEERING EXHIBITION

BY TRAIN, CAR, COACH OR PLANE IT'S EASY TO REACH THE SHOW



How to find us:

The exhibition will be held at the International Exhibition Centre, Donington Park, Castle Donington, near Derby. Donington Park lies where the three counties of Nottinghamshire, Derbyshire and Leicestershire meet, virtually in the middle of the country. It has excellent road connections, being only three miles from the major trunk routes of the M1 and M42 motorways. East Midlands International Airport is but two and a half miles away and has a comprehensive domestic and European flights schedule. The main line Intercity railway stations of Derby and Nottingham are a twenty minute drive away and are well served by public transport and taxi services. Our usual exhibition link bus service will operate from DERBY Station.

Stagecoach
MIDLAND RED

EXHIBITION LINK

Stagecoach Midland Red will be operating a special service from **DERBY** Railway Station to the International Exhibition Centre at Donington during the exhibition. The service will also run on the Sunday.

EXHIBITION LINK TIMETABLE

Daily throughout the Exhibition including Sunday

OUTWARDS:					
Derby Railway Station	10.10	10.50	11.30	12.10	12.50
Exhibition, Donington	10.30	11.10	11.50	12.30	13.10
RETURN:					
Exhibition, Donington		14.45	15.45	16.45	17.45
Derby Railway Station		15.05	16.05	17.05	18.05

THURSDAY'S LATE NIGHT SERVICE
departs 18.45 & 19.45

Times given are approximate and may be subject to variation.
Return fare (approx.): Adults £2.80, Child/Senior Citizen £2.20.

ROUTES TO CASTLE DONINGTON:

From the South **via M1:** Leave the M1 at junction 23A following the signs for East Midlands Airport (A453) and the brown 'tourist' signs for Donington Park. Go past the main entrance to the airport (traffic lights) and proceed for approximately 2 miles until a right turn signposted Donington Park and Castle Donington takes you on to the B6540. 300 metres along this road brings you to the main entrance of Donington Park. Follow internal signs for the Exhibition Centre.

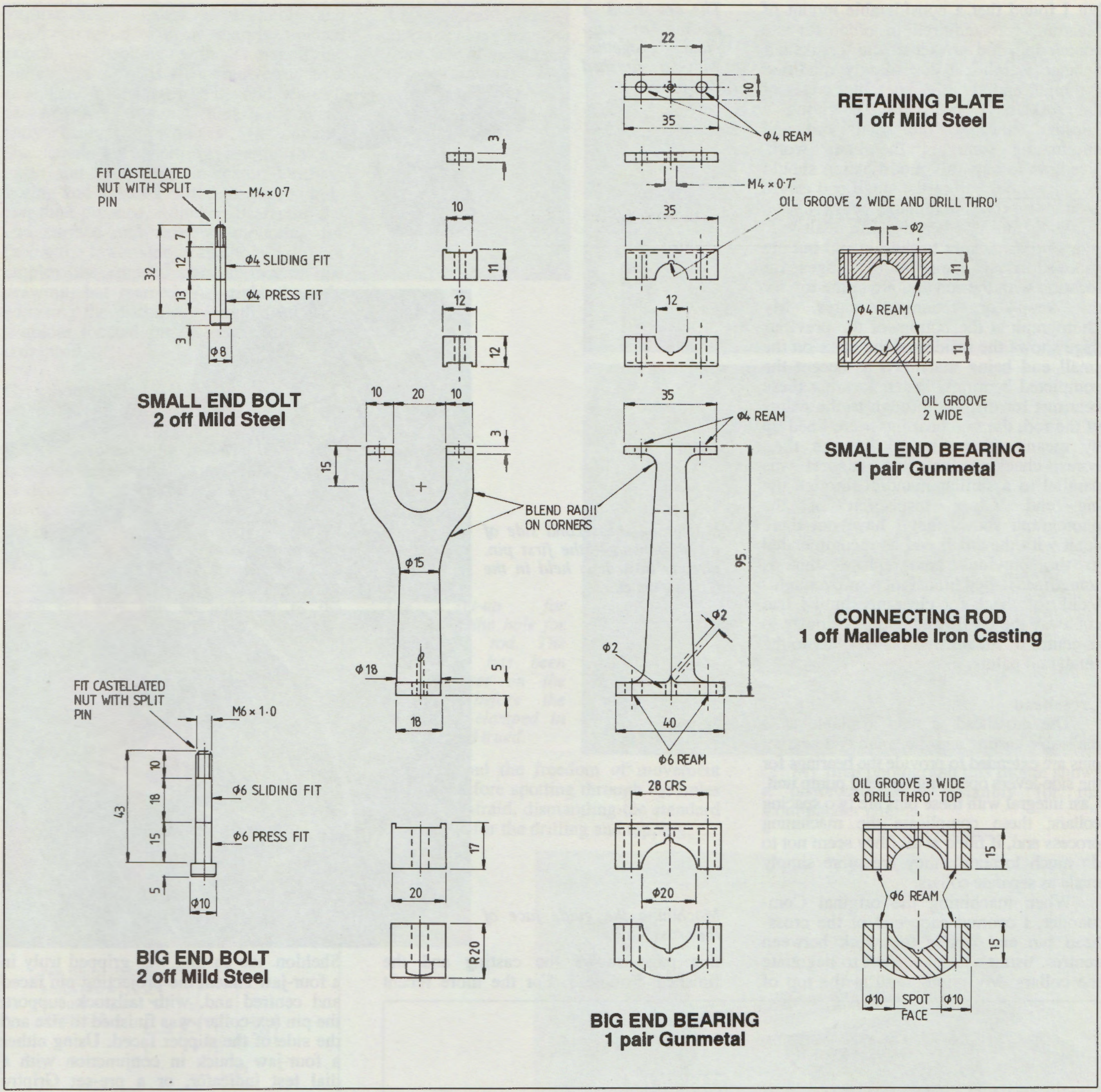
From the North **via M1:** Leave the M1 at junction 24 and follow the signs for East Midlands Airport (A453) and the brown 'tourist' signs for Donington Park. Go past the main entrance to the airport (traffic lights) and proceed for approximately 2 miles until a right turn signposted Donington Park and Castle Donington takes you on to the B6540. 300 metres along this road brings you to the main entrance of Donington Park. Follow internal signs for the Exhibition Centre.

From the South West **via M5 & M40 to M42:** From the M5 join the M42 at junction 4A and from the M40 join the N42 northbound at junction 3A. Continue northbound on the M42/A42. Exit A42 at junction 14 following the signs for East Midlands Airport and the brown 'tourist' signs for Donington Park on to the A453. Go past the Paddock Entrance turn-off for approximately 800 metres, then take the left exit slip road on to the B6540 signposted Donington Park and Castle Donington. 300 metres along this road brings you to the main entrance of Donington Park. Follow internal signs for the Exhibition Centre.

From the North **via M6:** Leave the M6 at junction 15 heading for Trentham Gardens and Uttoxeter (A50 by-pass). Once on to the A50, continue right through and on to the new road section to the final roundabout where the right turn exit brings you to Hilton and the A5132. Picking up the signs for East Midlands Airport, continue on the A5132 through Willington to its junction with the A514. Take the right turn at this junction, over Swarkestone bridge picking up signs for Donington Park en route, passing the Paddock Entrance turn-off for approximately 800 metres, then take the left exit slip road on to the B6540. 300 metres along this road brings you to the main entrance of Donington Park. Follow internal signs for the Exhibition Centre.

AMPLE **FREE** CAR & COACH PARKS AT DONINGTON

ROUTES SIGNPOSTED TO DONINGTON PARK AND CASTLE DONINGTON

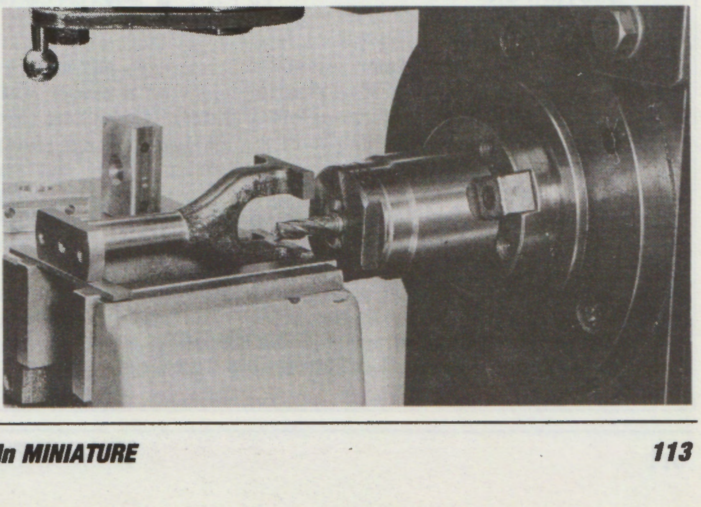


drilling the big end bolt holes.

Note: great care is necessary at this marking out stage since clearances between bolt and crankpin are small.

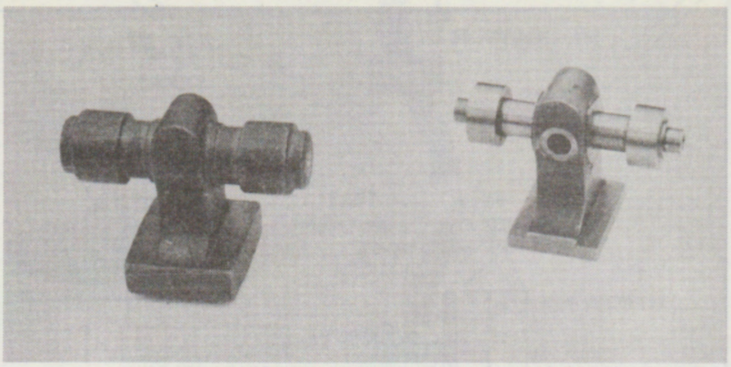
At the same machine setting, the 18mm wide groove to accept the palm of the rod may be milled – I used a sharp 1/4" diameter end mill here, cutting the groove in stages. The bottom ends of the bolt holes may be spot faced to accept the bolt heads; as an alternative, I milled straight across at a distance from the bolt holes such that the shoulder so formed would engage with a flat milled on the side of the bolt head to provide a lock against its rotation. The bearing is now offered up to the rod, its position centralised and the bolt holes spotted through and drilled into the palm of the rod, the outer end of the holes being spot faced to provide clearance for the nuts. As seems to be common practice in full scale, I usually turn the rod and assembled bearing between centres to round off the outer edges. For this purpose the rod alone is re-mounted between centres – big end towards the tailstock – and a fixed steady set up on the still parallel portion of the shank; the rod is then removed leaving the steady setting intact and the big end bearing firmly assembled.

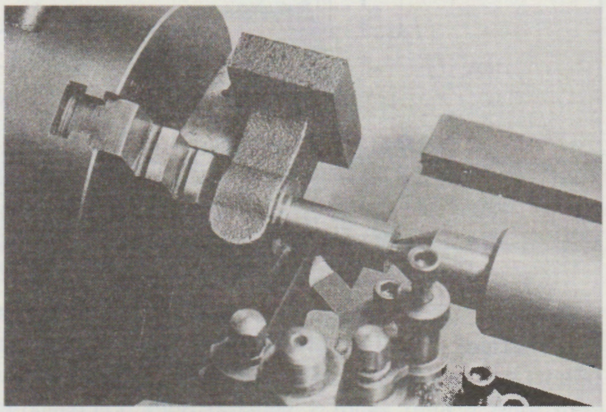
With the rod returned to the lathe, supported by headstock centre and steady, the end of the bearing is centre drilled, producing a complete unit centred at either end. The sides of the bearing and the palm of the rod can then be turned and the shank finished to its final taper. At the small end of the rod, the drawing indicates that all radii are to be 'blended',

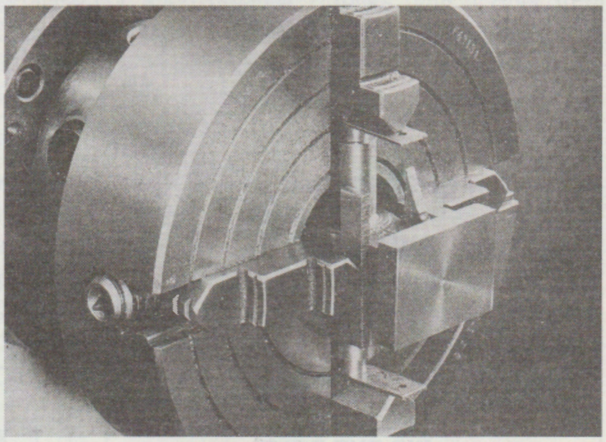

Milling the inside face of the small end of the connecting rod.

but I found that a considerable mount of blending was required in order for the connecting rod to clear the crankshaft balance weights; I accordingly modified the small end slightly. The outer edges of the fork have been turned, giving a familiar shape to the small end and eliminating some of the hand work. Needless to say. this modification should be carried out before the small end centre is cut away (but see remarks below!).

The small end bearings are dealt with in a similar manner to the big end but are grooved along their bottom edges for location with the rod and along the top for the keep or retaining plates. My photograph at the bottom of the previous page shows the insides of the forks on the small end being machined to accept the completed bearings. When locating these bearings for drilling through to the palms of the rod, the two bearings were lined up by means of a mandrel through their bores, checking that this mandrel was parallel to a similar mandrel through the big end. Close inspection of the photograph shows that I have not there dealt with the small end as recommended in the previous paragraph – this is sometimes called hindsight – or oversight! I did not check for clearance until I had cut away the centre and had laboriously to re-centre by means of a plate bolted to the small end palms.


The crosshead: a casting as supplied together with a finished item.


Machining the second side of the crosshead – the first pin, already turned, is held in the Griptru chuck.

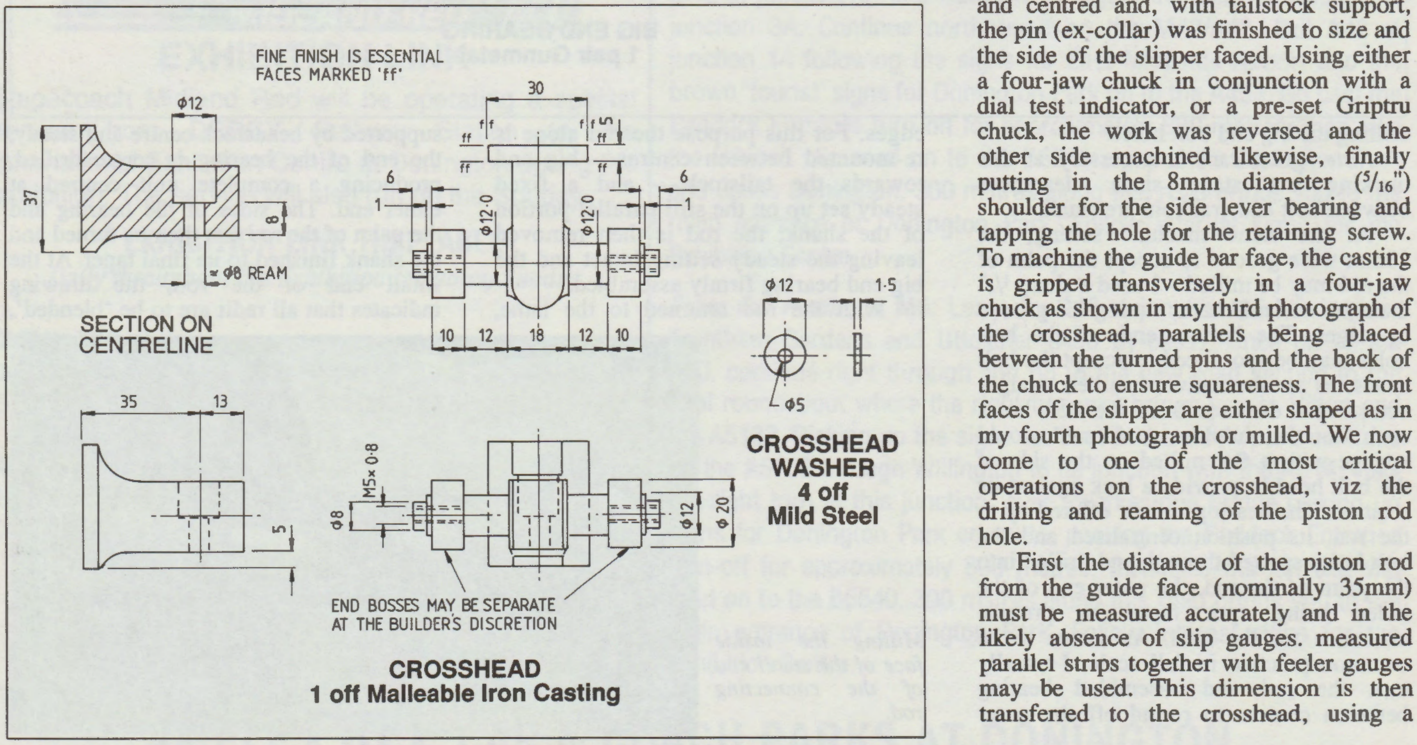

Machining the guide face of the crosshead.

Crosshead

The crosshead is also available as a malleable casting and the small end bearing pins are extended to provide the bearings for the side levers operating the feed pump unit. Cast integral with these pins are two spacing collars; these complicate the machining process and, if fitted at all (they seem not to do much locating), they are more simply made as separate collars.

When machining the original Commander, I centred each end of the crosshead pin and turned the work between centres, using a cranked tool to negotiate the collars. My photograph at the top of this page shows the casting and the finished crosshead. For the more recent Sheldon. the casting was gripped truly in a four-jaw chuck, the projecting pin faced and centred and, with tailstock support, the pin (ex-collar) was finished to size and the side of the slipper faced. Using either a four-jaw chuck in conjunction with a dial test indicator, or a pre-set Griptru chuck, the work was reversed and the other side machined likewise, finally putting in the 8mm diameter (5/16") shoulder for the side lever bearing and tapping the hole for the retaining screw. To machine the guide bar face, the casting is gripped transversely in a four-jaw chuck as shown in my third photograph of the crosshead, parallels being placed between the turned pins and the back of the chuck to ensure squareness. The front faces of the slipper are either shaped as in my fourth photograph or milled. We now come to one of the most critical operations on the crosshead, viz the drilling and reaming of the piston rod hole.

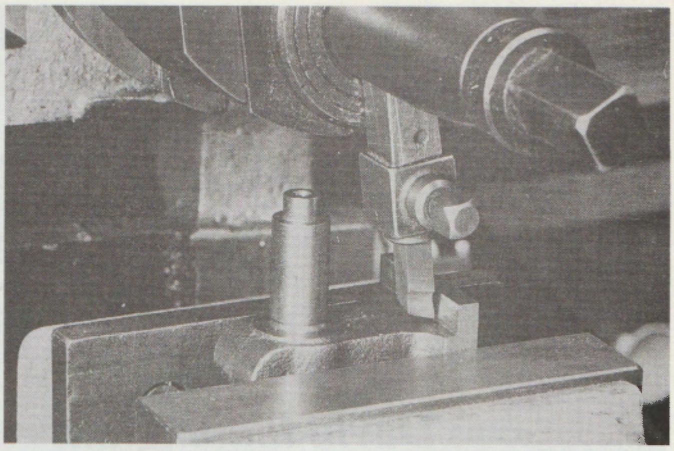
First the distance of the piston rod from the guide face (nominally 35mm) must be measured accurately and in the likely absence of slip gauges. measured parallel strips together with feeler gauges may be used. This dimension is then transferred to the crosshead, using a



CROSSHEAD
1 off Malleable Iron Casting

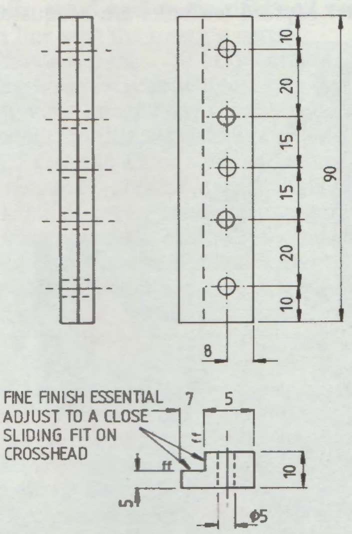
CROSSHEAD WASHER
4 off
Mild Steel

vernier height gauge if available and lightly marked with a sharply pointed punch – checking with a magnifying glass. The work is then transferred to a faceplate angle-plate set up and with all faces square, the punch mark is set to run truly using a 'wobbler' (a suitably sharpened steel knitting needle in my case) and a dial test indicator. Drilling, boring and reaming of the piston rod hole can then proceed, followed by facing the end surface and mandrel mounting for facing the lower side of the hole. I did not employ the stepped bore shown on the drawing, but reamed $^{5}/_{16}$" right through, adjusting the piston rod length so that its shoulder located on the top face of the crosshead.

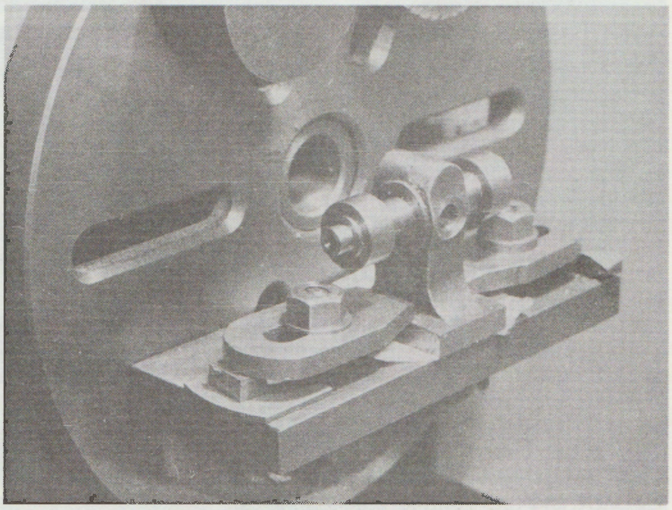

Using the shaping machine to clean up the front face of the slipper of the crosshead.

Crosshead Guide Bars

These relatively simple components were milled from $^{3}/_{4}$" × $^{3}/_{8}$" bright mild steel bar. Ideally the material should be annealed before milling to avoid the risk of distortion of the cold worked material during the asymmetrical machining – I got away without doing this! The fitting of the guide bars to the standard is deferred until the piston rod/crosshead/connecting rod assembly is complete when the bars can be clamped to the standard and the freedom of movement checked before spotting through the holes and, I am afraid, dismantling the standard once again for the drilling and tapping.

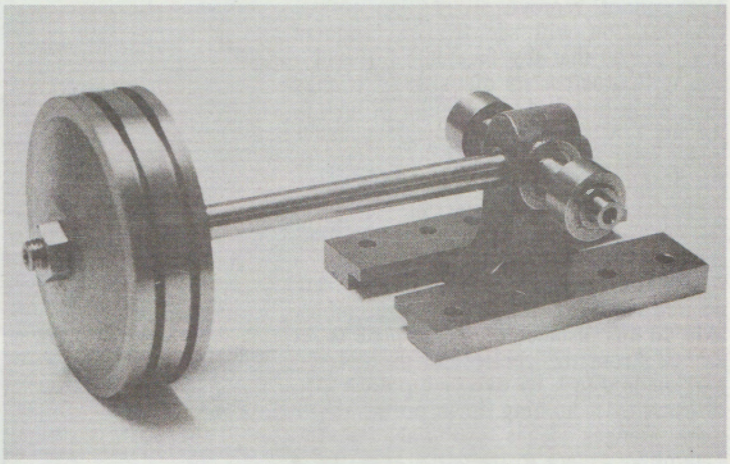


CROSSHEAD GUIDE
2 off Mild Steel


The set-up for machining the hole for the piston rod. The angle-plate has been precisely set on the faceplate before the casting is clamped in position and trued.

My final photograph this month shows a piston/crosshead assembly for the Commander engine.

To be continued.


A piston/crosshead assembly for the Commander engine.

A THREE TON DOUBLE ACTING STEAM HAMMER

Continued from page 118

Engineering in Miniature, September 1991, page 110 on the subject of these jacks.) As the total width of the flanges is $1^{7}/_{8}$" and the column flanks $1^{1}/_{4}$", the flange each side will be $^{5}/_{16}$" from the flank. Set a depth stop to the milling cutter by interposing a block of this thickness between cutter and column.

Turn the assembly over and clamp down with the freshly machined faces down on the mill table as shown in my final photograph this time. Again set the $^{5}/_{16}$" depth stop and lightly mill over the edges. Do note that the toolmaker's clamp gripping the cylinder end of the castings has not been moved, nor should it be till later; also that the upper flange prevents the clamp directly gripping the port faces, so that packing pieces are additionally gripped. This clamp must be very firmly tightened.

It will be appreciated that, as we have milled down each side to the common $^{5}/_{16}$", the bolt holes to secure the cylinder halves and column base pads may now be marked off to $^{5}/_{32}$" from the outer faces. Do this now and drill all holes tapping size for 8BA, ie. No. 50 diameter.

To drill the holes in the upper cylinder flanges an extended drill will be required, and to do this grip a 2" length of $^{1}/_{8}$" diameter brass in the chuck, face one end, drill No. 50 to about $^{1}/_{2}$" deep. Into this hole insert the shank of this same drill with a dab of Loctite 601 and allow to cure for a few minutes. Clean the drill shank with fine emery prior to fixing. We now have an extended drill suitable for clearing the column flanks (see also *Engineering in Miniature*, November 1991, page 173 for further information on extended drills and reamers). The holes for the base flanges are better marked and drilled from the underside.

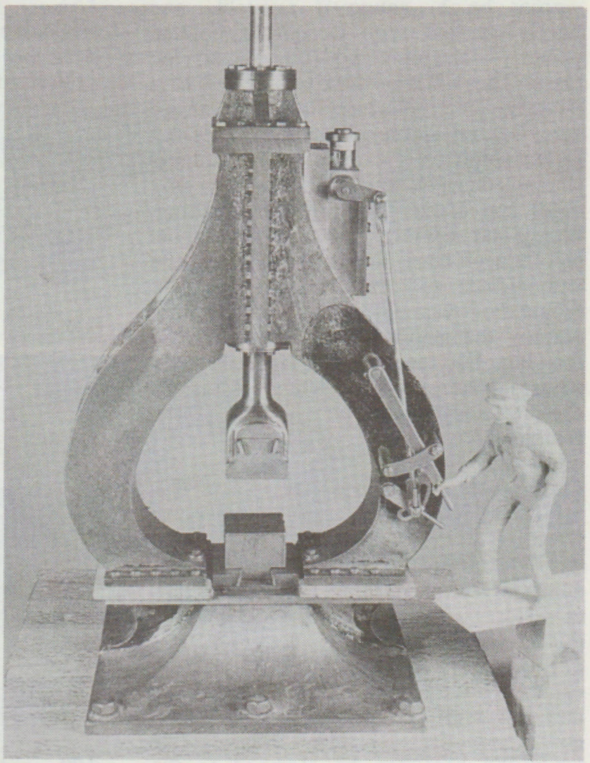
To be continued.

Robert Morrison's 1865

THREE TON DOUBLE ACTING STEAM HAMMER

in $^1/_2$" scale

David Piddington

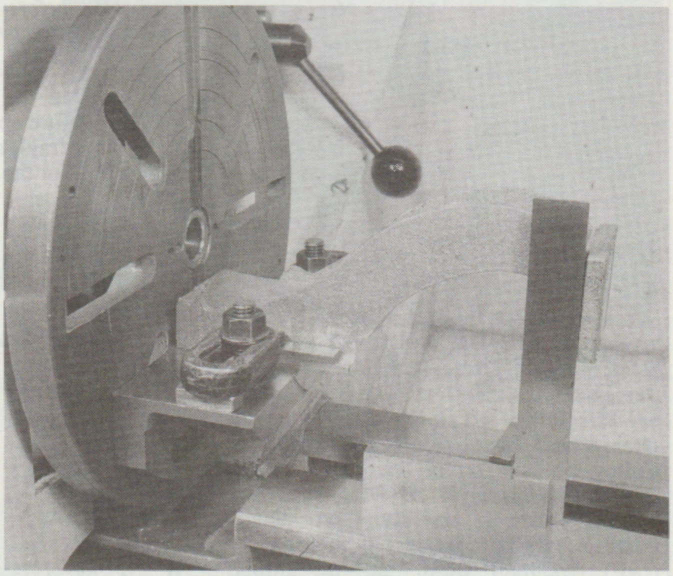


Part Three

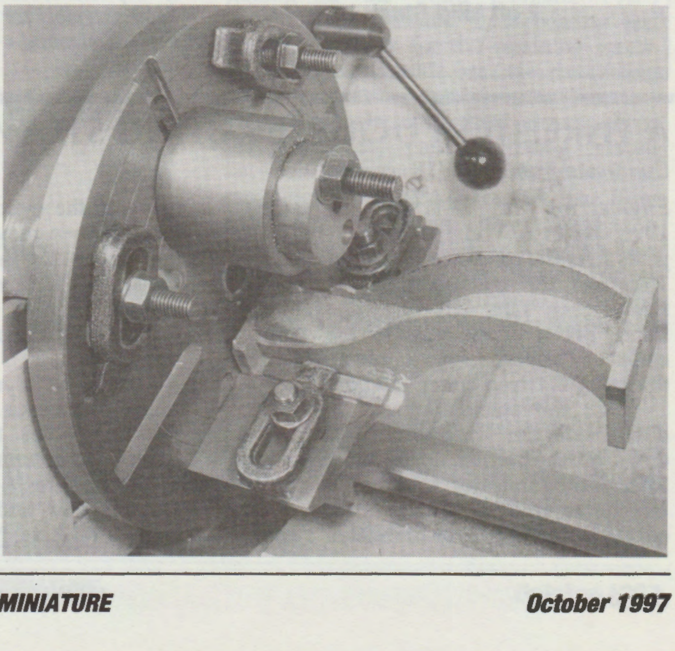
We may now turn our attention to facing off the bottom pad of the column. Obviously this **must** be exactly at 90 degrees to the common bolting faces previously machined. There are a number of ways in which this might be achieved, but as we shall be using the lathe faceplate for later work, I thought I would use this accessory here. If you have never used your faceplate before, this is as good a place to start as any. Certain precautions **must** be taken, the most important being to balance the rotating masses. Failure to do so correctly is dangerous for if your lathe is not bolted down, it can literally walk across your workshop, or rock violently and the workpiece be displaced, fly out and hit you. If that happened . . . ! I leave you to imagine possible consequences. Put your faceplate on to the lathe spindle, reasonably tight, but not so tight you cannot remove it in the normal fashion. You will see from subsequent photographs that my faceplate has had a slot milled across its diameter to engage in a tenon fastened to a similar groove in the back of my angle-plate, the latter being very carefully set at 90 degrees to the working faces. A single bolt passing through both tenon and the faceplate groove aligns with the bolting slots, thus the single bolt allows the angle-plate to be secured simply and accurately in any desired position relative to the lathe's axis. In this instance the angle-plate is set at $1^5/_8$" from the centre and the column half secured to it by two clamp dogs, one on each side, holding dawn on the upper flank flanges. It is essential that the column is square to the lathe axis, for it will be understood that the lathe axis is also the column's piston axis.

With a try square, check against the upper surface of the base flange as shown in my first photograph and note whichever corner is furthest from the faceplate. When facing the pad, machine away to this particular corner to the $^5/_{32}$" thickness dimension – mark the corner with a dab of blue marking fluid. It will now be obvious why we had to take out the initial twist from the castings. You may also note that I placed additional packing beneath the toe of the clamp dog to spread the grip more securely along the length of the thin gunmetal flange.

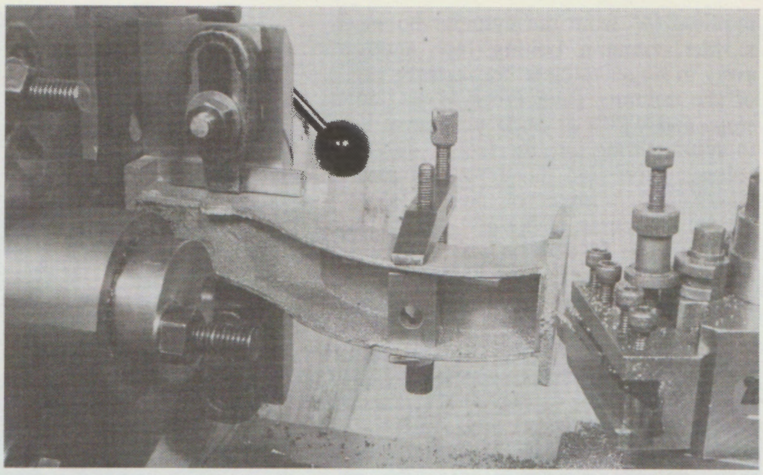
Balancing a lathe faceplate is never a quick procedure and can, at times, be frustrating. However, never, **ever**, lose your patience; if in doubt, stop and have a cup of tea and have a quiet think about what you are doing. Some of the frustration comes out with never having the right shaped block of metal to use as a balance weight, or the right length of bolts! Myford tee bolts are adequate, but



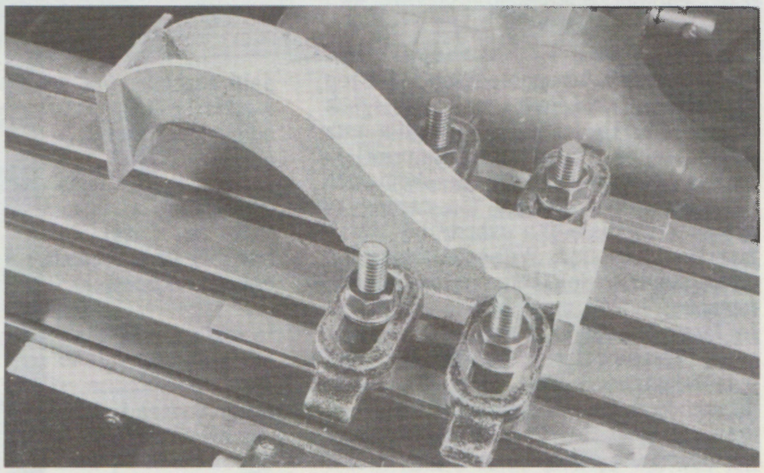
Setting a column casting on the angle-plate on the lathe faceplate for facing the bottom bolting flange. Note that the counterbalance weights have still to be fitted.



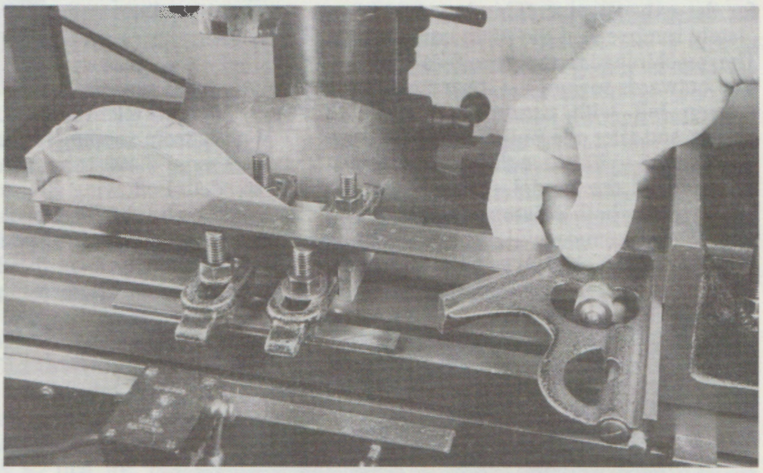
The same set-up showing the balance weights including two additional faceplate clamps.



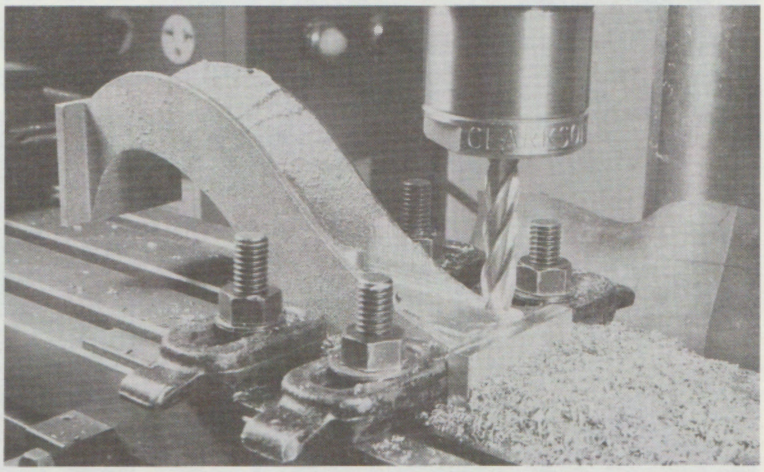
It was found necessary to fit a support block held by a toolmaker's clamp to damp vibrations.



The set-up in preparation to machine the cylinder bolting face.



Checking the alignment of the column side with a square to an angle-plate which is clamped at 90 degrees to the milling machine table.



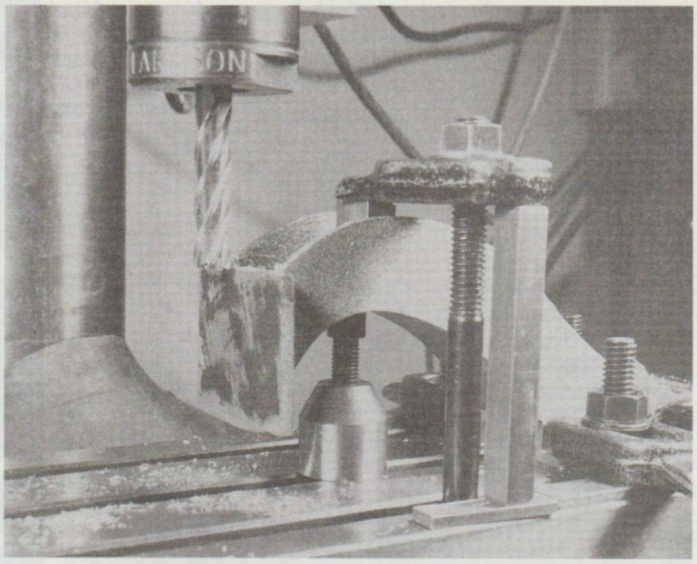
Milling the cylinder bolting flange.

inevitably one purchases a set of the long ones (6") and, after some use and cutting down for clearing chucks and/or cutters, one has a motley collection of tee bolts each around 2½" to 3" long and more long ones have to be purchased, or made. Proprietary clamping sets do have a range of bolt lengths but, as far as I am aware, there is no such set immediately adaptable to the Myford ML7 and ML10 series lathes. Such a set would be expensive, but I am sure there would be a market for it. Until that happy day, we have to improvise, which is what our hobby is mostly about. For balance weights, lathe changewheels are particularly useful, but those like myself with gearbox fitted machines will not have many, if any at all, of these gears so other blocks of metal are required. In my second photograph, you will see that I used an available round block, formerly a fixture from another job, and I discovered that at extreme radius to clear the bed there was still some 'wobble' of the lathe. I then positioned two clamp dogs each side, symmetrically, and found that with fine adjustment of these I could run the lathe at 420 rpm which is adequate for this particular job. Take light facing cuts with a very sharp tool to establish the basic dimension. Do check the tightness of the clamping bolts before commencing the facing operation and also stand well to the right and not in direct line with the rotating parts.

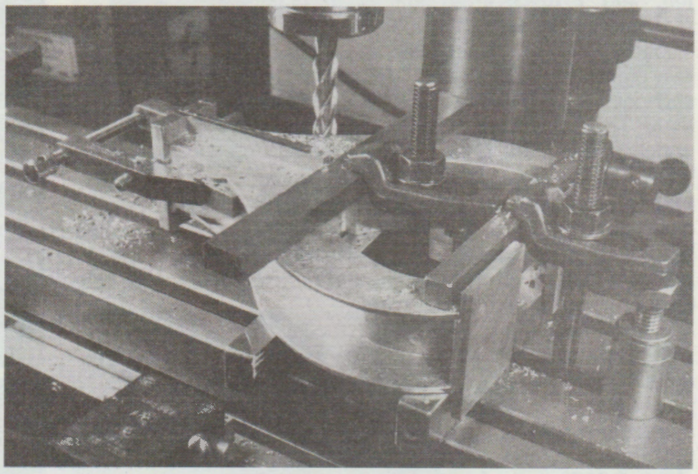
The advantage of my method of writing these articles where I type immediately what I have done for any particular procedure is that, should something go awry, I can add in suitable comments. In this instance, despite taking light cuts about 0.005" each, I was getting a lot of tool vibration and 'chatter', so much so that the column was displaced slightly on the angle-plate and required re-setting. It occurred to me that the 'U' section of the column sides was relatively weak in relation to the upper cylinder bulk and the lower pad, so I made up a spacer block to fit tightly between, but without distorting, the thin side flanks of the column and this was secured with a 2" toolmaker's clamp as shown in the photograph at the top of this page. I continued with the 0.005" cuts and succeeded in completely facing the pads on both column halves, but I made sure that my toolbit remained very sharp.

Thinking back to when we commenced work on the columns, I mentioned that when the still hot castings were removed from the foundry moulds, stresses were set up within the casting. I expect you will be familiar with the frustrating way in which, when a piece of mild steel is milled away on one side, it assumes a graceful curve and requires straightening. I discovered that one column – the one that had 'chattered' – had resumed its twist and, on further checking, the second one had also moved slightly. I re-twisted them both as previously described and then the slight discrepancies were corrected by a process which I will describe shortly.

In the next step we will machine the cylinder port face bolting area on one column half, and the corresponding face on the other. To do this I clamped down on the cylinder face very securely with four clamps as shown in my next photograph. The column flanks are aligned parallel to the milling machine table axis by positioning an angle-plate at 90 degrees to the axis and from this datum aligning the column with a set square as shown on the previous page. Using a long series slot drill, set a depth stop to the



Milling the outside edge of the bottom flange.



The two columns clamped together for machining the cylinder joint side.

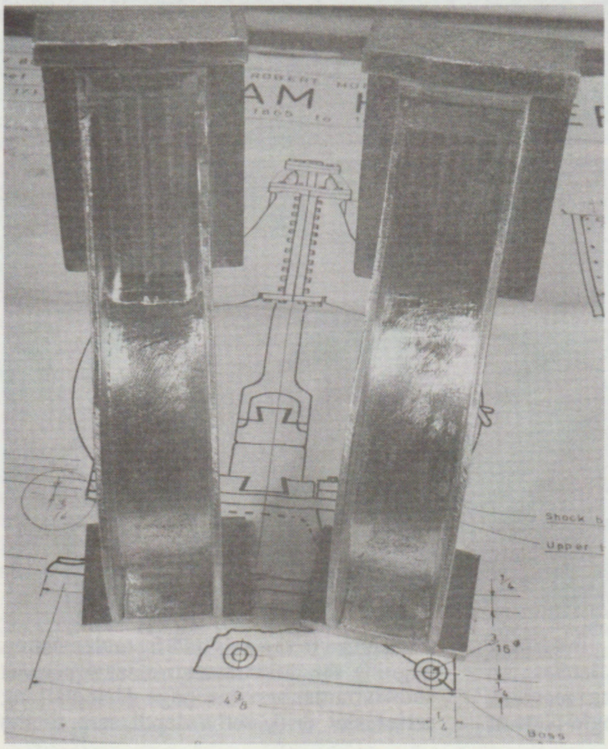
required $^{5}/_{8}$" from the cylinder bore/axis, ie. the common bolting face and mill away in stages to clear between the flanks of the column. Remember to set length stops and width stops, if you have them, to avoid cutting into the flanks, the lower column curve and the upper flange. The length milled must, of course, slightly exceed the length of the port face at $2^{1}/_{2}$". At this time it will be prudent to mill away the side of the top flange to $1^{3}/_{16}$" from the common bolting face. Both operations are seen in the photograph.

One acquaintance said he enjoyed my 'action' pictures complete with swarf, so I rarely sweep these bits away before taking photographs to illustrate my articles!

Repeat for the second column half and then, without removing from the mill table, set the cutter at $2^{1}/_{4}$" from the bolting face and mill off the outer side of the base flange. My photograph at the top of this page shows how a toolmaker's jack is positioned beneath the column's arch and clamped clown on top prior to milling. Note that the jack should be finger-tight only against the casting to reduce any distortion when the clamp pressure is applied. Without moving the cutter depth setting, remove the column, replacing it with the first one and repeat for facing the pad back flange.

We can now decide which column half will take the steam chest. The only difference is the semi-circular 'bump' on the right hand side of each casting flank which, on the chosen one, is the shroud for the exhaust pipe. This bump is completely removed on the plain column half. The machining of the port face leaves a step outwards toward the inner face of the column but with careful use of small chisels and files the bulk of the step may be removed to improve the visual effect at this side of the model. The photograph below shows both column halves side-by-side. The port face will conceal most of the step on that column and the gap could be filled in later prior to painting.

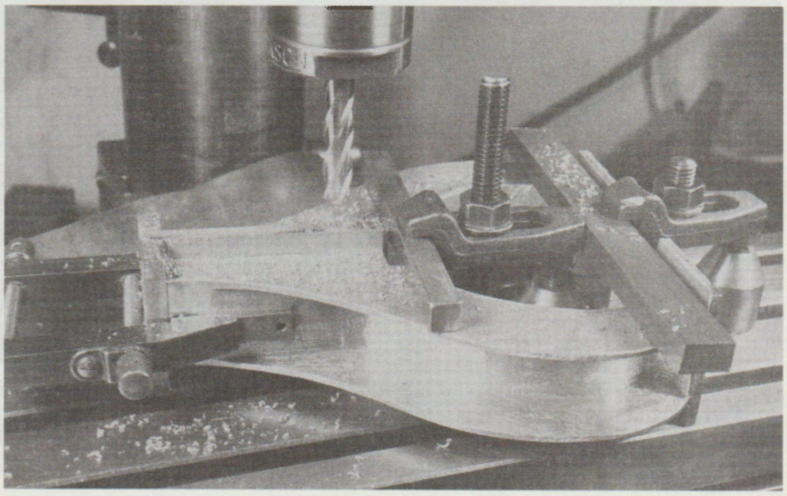
My sample castings had suffered slightly from slipping of the core, and I had a lot more metal to remove than had been intended. Following advice from a patternmaker colleague I have put a tongue on the core-print with a corresponding slot on the core-box and this should resolve the problem on the retail castings.



Left: A pair of columns machined so far.

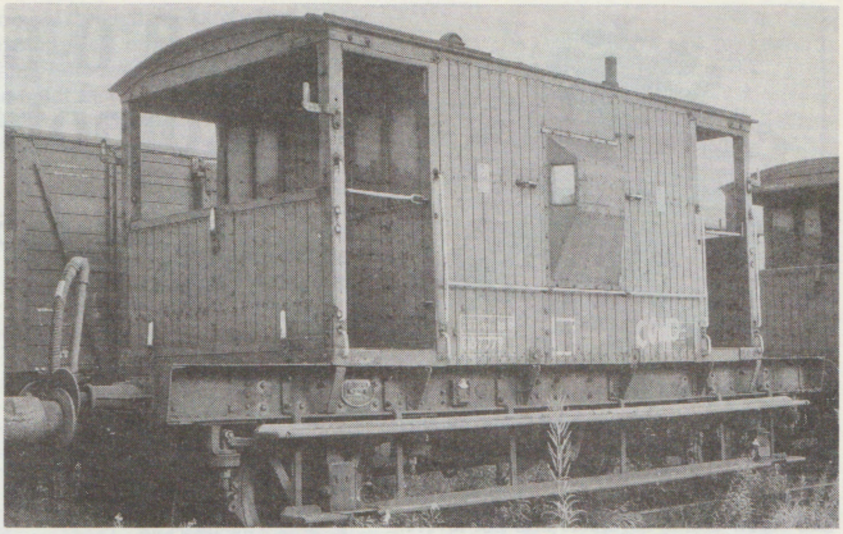
Next the sides of the base pads and cylinder joint flanges should be squared off each side. For ease of production this is definitely a milling machine operation. The photograph above shows how the two column halves are clamped together with the machined base flanges in alignment and the cylinder faces kept in contact with a toolmaker's clamp. Two parallel packings of equal thickness are inserted between the table and the column flank sides and a dog support bar across and above each. By this means, the assembly may be clamped down securely enough to lightly mill off the sides. Note the toolmaker's jack beneath the rear of each clamp dog. (See also my article in

Continued on page 115



Below: The columns clamped together for machining the opposite cylinder joint side.

LNER 20 TON BRAKE VAN



Doug Hewson

Part Six

Before we venture into our body building course, there are just a few items I would like to tidy up on the underframe of the brake van, not least because I have had a few telephone calls saying that I had said to make one or two of the items but that I had not described how I did it!

The problem is that when a series like this follows hard on the heels of one where some of the items required on the model are very similar, I always tend to assume that you will have read the previous series and learnt everything off by heart ready for the next onslaught. However, I now realise that you probably do exactly as I do and just read the descriptions that are of interest to you at the time.

At the completion of a volume, my copies of *Engineering in Miniature* are bound and put away on the bookshelf and then, a couple of years later, I find I am looking back to find something that has suddenly come up which was not of interest at the time, but is suddenly required to make life easier now! I have also found that there are quite a number of new model wagon builders whose fancy has been taken by the brake van and who are building this as a first project. It is gratifying for me (and for the membership secretary of the Ground Level 5" Main Line Association) to receive letters from new wagon builders saying that they have only just discovered the articles and want to build something as a 'quickie' between constructing locomotives. I am still having to enter at least three new names on my computer every week.

The thing is, once the new builders have completed one wagon they become 'hooked' – I don't know anyone who has stopped at just one wagon – you can't 'play trains' with just one wagon! So I should have realised that new builders require *all* the information within each construction series.

Well, the first thing to revise is the making of the leaf springs which, when I look back, were described a year ago – doesn't time fly!

At least two new builders have telephoned asking for advice on making the springs, so for the benefit of them and as revision for other builders, this is the way I tackle mine.

First of all, you need the right kind of material and the spring steel I use and supply is in an annealed state and so it can be worked like ordinary mild steel. It can be bent, cut and drilled using normal workshop equipment and standard high speed steel drills. To cut all the leaves, I have an old piece of timber underframe which is marked off in pencil with the lengths of all the leaves. I clamp the timber in the vice with the markings projecting to the left (as I am right handed) and then clamp, up to the first mark, a similar piece of wood on the top to act as a stop.

To cut the spring steel, I have a pair of the very stout type of tin snips, not the type which look like scissors, although they would probably do just as well, and I rest these against the end of the gauge. The spring steel is then pushed through the jaws of the tin snips until it hits the improvised stop. Cut four to this size, or in my case twelve because I never build just one wagon at a time, and then move the stop up to the next mark and snip off the next four and, as 'LBSC' used to say, 'ditto repeato' until you have a large heap of assorted leaves.

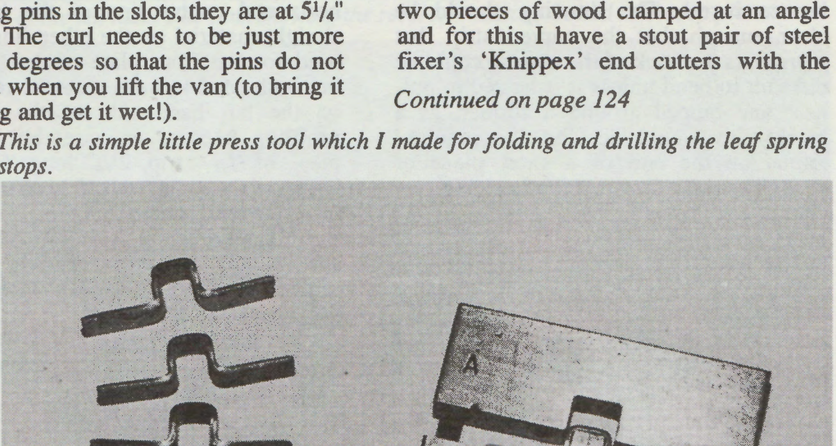
The top leaves need to be cut $5\frac{5}{8}$" long and these have a slot in each end for the spring pins, so you need to drill a No. 30 hole $\frac{1}{4}$" from each end of the leaf and then saw down to it with a junior hacksaw to form the slot. The ends of the leaves have to be curled around a piece of $\frac{1}{8}$" diameter silver steel so that, when you sit the spring pins in the slots, they are at $5\frac{1}{4}$" centres. The curl needs to be just more than 90 degrees so that the pins do not drop out when you lift the van (to bring it to Gilling and get it wet!).

The second leaves are about $5\frac{5}{16}$" long and also require slotting for the pins, so you can use the top leaves as a jig for drilling the second ones, and in fact the third leaves may also require a ha'peth of a slot at each end. The third leaves are actually $5\frac{1}{8}$" long and then the remaining leaves step down in $1\frac{1}{16}$" increments.

I have a fixture which I have made for drilling the centre holes which takes four leaves at a time. It consists essentially of a base plate with a bridge over the centre with a hole to take a No. 46 drill, the four leaves being slipped through a slot formed in the bridge. Under the bridge is a lead screw with a fixed knurled nut and left and right hand threads acting upon die blocks at each end. As the nut is turned, the die blocks come together to trap the leaves centrally under the bridge. The No. 46 drill is then passed through the top of the bridge and the leaves, and then the next four can be treated in the same way. Since I made this useful little tool, it has been in great demand with all of our club members for doing their wagon springs (so would the last person to use it please return it!). The corners of each spring have to be cropped off except for the three upper leaves and this should be done with another simple guide so that the mitres are all the same. This can also be done with two pieces of wood clamped at an angle and for this I have a stout pair of steel fixer's 'Knippex' end cutters with the

Continued on page 124

This is a simple little press tool which I made for folding and drilling the leaf spring stops.



LNWR 0-6-2T 'Coal Tank' Locomotive in 5" gauge

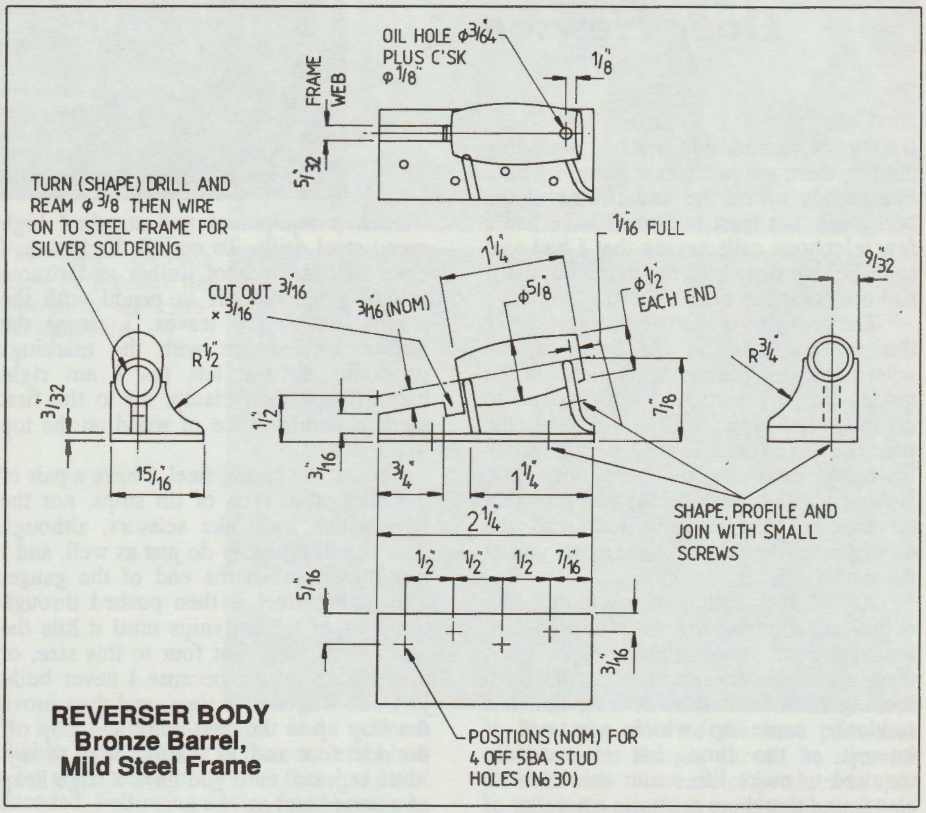
described by Hotspur

Part Forty six – The reverser

Like so many of the components on this prototype, the reverser is quite small and unusual in that most of the LNWR locomotives, including the tank classes, had screw action reversers and not levers. Whilst looking through my books of photographs, it is clear that originally the handwheels fitted were quite lightweight in appearance and had six spokes; whereas early in this century the more chunky five spoke wheel was introduced. This probably coincided with a change in the screw mechanism and I understand ten turns are needed to move from one full gear position to the other. One of my photographs shows the later style of wheel fitted to the preserved Coal Tank, so those building the locomotive to represent the version from LMS days and later should fit the more robust type.

It will be seen that the body of the casting is barrel shaped, in which the handwheel drives the outer part of the screw and draws the inner portion backwards and forwards to move the weighshaft lever. Overall, the unit should be less than 2" long, but I have added to this slightly to fit a sliding block in front to take the turning moment of the screw and some of the operating load. It will be seen when we come to the cab that the outer end of the block protrudes through where it is attached to the reach rod.

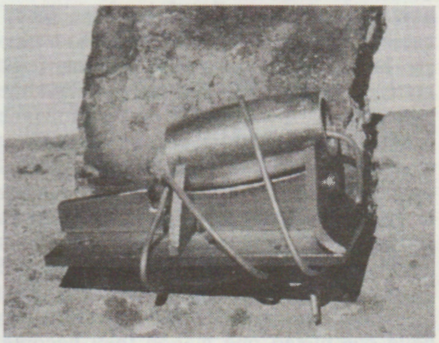
An initial attempt to make the body was a disaster when made as a brass fabrication, so I drew out the sizes again to make one from steel plate and added a bronze barrel. The drawing should be clear enough, but the curved strip that represents the back of the casting could be difficult to bend unless it is heated to red-heat and tapped around a former, as a blacksmith would do. Put the required radius on the end of a short piece of 1" × $^{1}/_{4}$" bright drawn mild steel bar and clamp a 2" strip of $^{3}/_{32}$" steel, also 1" wide, against it so that they both point upwards from the vice. The strip needs to protrude about $^{3}/_{8}$" so that it can be heated to red and persuaded over the radius. This is the same technique that I described for the spring hangers in one of my early articles.



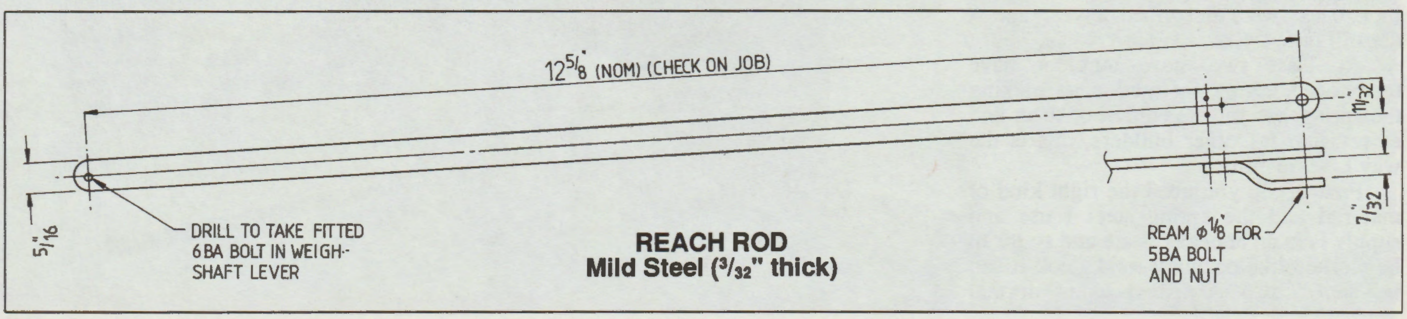
REVERSER BODY
Bronze Barrel,
Mild Steel Frame

Once this has been done, the strip needs a $^{1}/_{2}$" hole in it on a centre line $^{9}/_{32}$" in from the right hand side, looking on to the rear face, and $^{13}/_{16}$" up from the end of the curve. Hold the strip securely whilst drilling it, then divide it into two along the horizontal centre line of the hole; the straight material on the other side will be used for the front plate of the 'casting', but both need to have material remaining on the left hand side of the hole for profiling later as an assembly. Another piece of $^{3}/_{32}$" strip, $2^{1}/_{4}$" long, forms the base, and the centre web of this frame is $^{3}/_{16}$" material half slotted into the front plate and retained as an assembly with 8BA screws, countersunk underneath, and with a plain head to hold the end plate, as this will later be filed away.

Machine and then file and smooth the barrel on the end of a piece of $^{5}/_{8}$" diameter cast bronze bar and ream a $^{3}/_{8}$" hole through the centre. Part it off to the length shown and profile the centre web to allow the barrel to sit neatly into



The barrel and assembled frame for the reverser 'casting' wired together in readiness for silver soldering.



REACH ROD
Mild Steel ($^{3}/_{32}$" thick)

position; overhanging at the rear. Each half of the hole in the end plates will also need chamfering slightly to let the barrel sit snugly into place. Before silver soldering the assembly, mark out and drill the four holes in the baseplate and then tap the holes for the bolts to be fitted from inside the tank through the 1/8" stiffening plate, to look like studs.

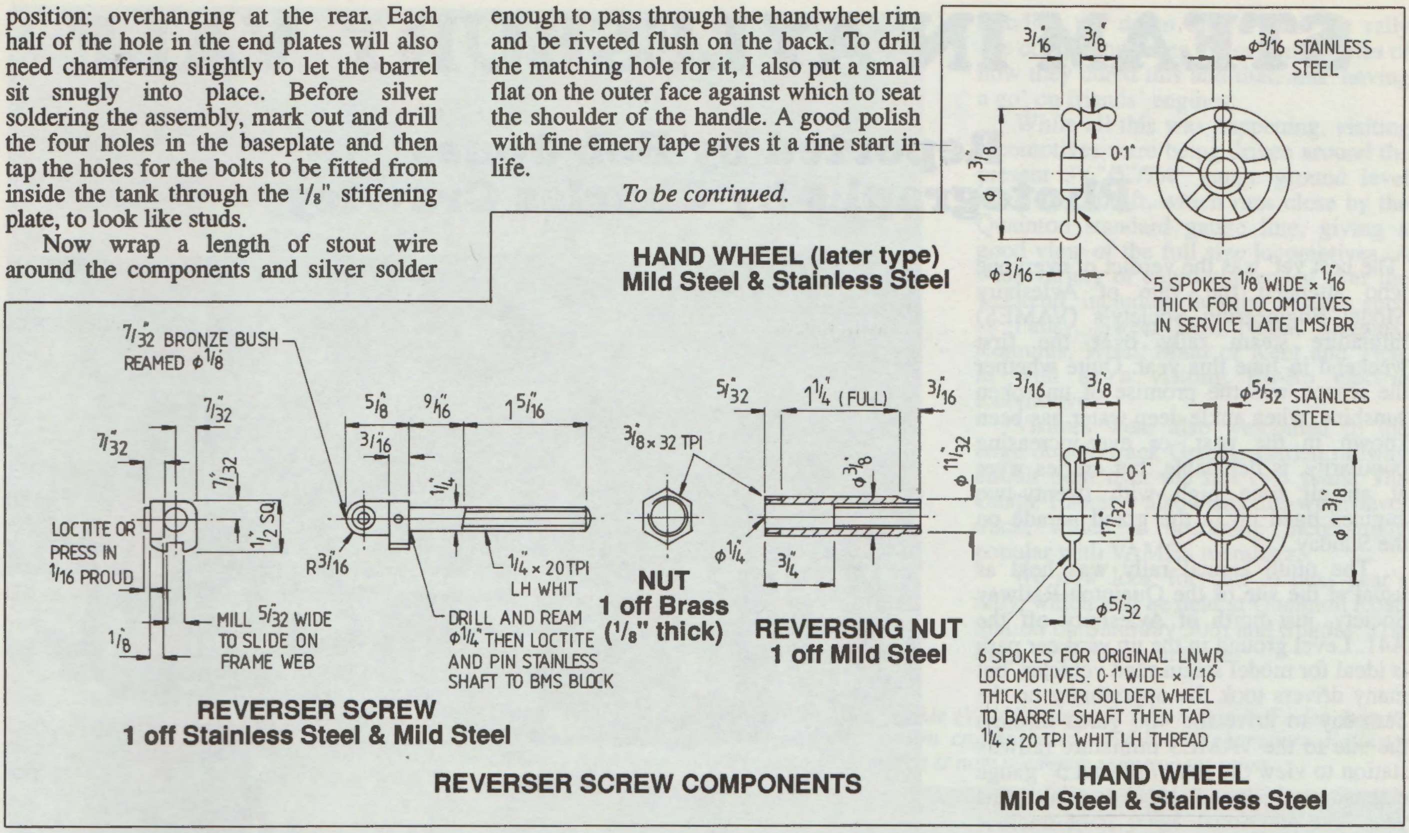
Now wrap a length of stout wire around the components and silver solder the assembly together. My photograph shows how I made the bundle ready for fluxing. This was done in two stages and, after cleaning, the end plates were profiled and the edges radiused to look like a casting before putting it to one side.

To begin the operating mechanism, I made the 1/8" nut from 1/2" A/F brass hexagon bar. The next operation is to turn a short length of 7/16" bright drawn mild steel round bar to make the reversing nut which must be a close fit in the barrel of the reverser casting. Turn one end 0.003" to 0.004" undersize for 5/32" and thread it 3/8" × 32 tpi to take the nut, which can be used as a gauge. By reducing the diameter for the threads slightly, this prevents them binding in the bore of the barrel during assembly. Drill the tapping size hole up the centre at the same setting and counterbore it 1/4" diameter for 3/4" depth, and then tap 1/4" × 20 tpi left hand. Part off a full 1 5/8" long and reverse it in the chuck to add the shoulder 11/32" diameter by 3/16" long. This should be positioned to ensure the shaft can rotate in the barrel and adjusted for end float as the locknut tightens on its thread.

The wheel is made from 3/16" steel plate, marked out ideally whilst still part of a larger piece so that it can be easily held to drill the holes for the openings. Depending on which period the locomotive represents, mark out the spokes and drill either five or six holes and enlarge them to form the openings. Be sure to keep a central pop mark so the plate can be set up in the 4-jaw chuck to bore the centre hole for the shaft and machine away the excess thickness to form the spokes. My two drawings give the necessary sizes.

Both the handles are made from stainless steel for obvious reasons and I make mine to include a spigot of about 5/64" diameter which is turned to be long enough to pass through the handwheel rim and be riveted flush on the back. To drill the matching hole for it, I also put a small flat on the outer face against which to seat the shoulder of the handle. A good polish with fine emery tape gives it a fine start in life.

To be continued.


3/16"
3/8"
φ3/16" STAINLESS STEEL
0·1"
φ 1 3/8"
φ 3/16"
5 SPOKES 1/8" WIDE × 1/16" THICK FOR LOCOMOTIVES IN SERVICE LATE LMS/BR
7/32" BRONZE BUSH REAMED φ1/8"
7/32"
7/32"
7/32"
1/2" SQ
LOCTITE OR PRESS IN 1/16 PROUD
MILL 5/32" WIDE TO SLIDE ON FRAME WEB
1/8"
5/8"
9/16"
1 5/16"
3/16"
1/4"
R3/16"
1/4" × 20TPI LH WHIT
DRILL AND REAM φ1/4" THEN LOCTITE AND PIN STAINLESS SHAFT TO BMS BLOCK
3/8" × 32 TPI
5/32"
1 1/4" (FULL)
3/16"
φ 3/8"
φ 11/32"
φ1/4"
3/4"
3/16"
3/8"
φ5/32" STAINLESS STEEL
0·1"
17/32"
φ 1 3/8"
φ5/32"
6 SPOKES FOR ORIGINAL LNWR LOCOMOTIVES. 0·1" WIDE × 1/16" THICK. SILVER SOLDER WHEEL TO BARREL SHAFT THEN TAP 1/4" × 20 TPI WHIT LH THREAD

HAND WHEEL (later type)
Mild Steel & Stainless Steel

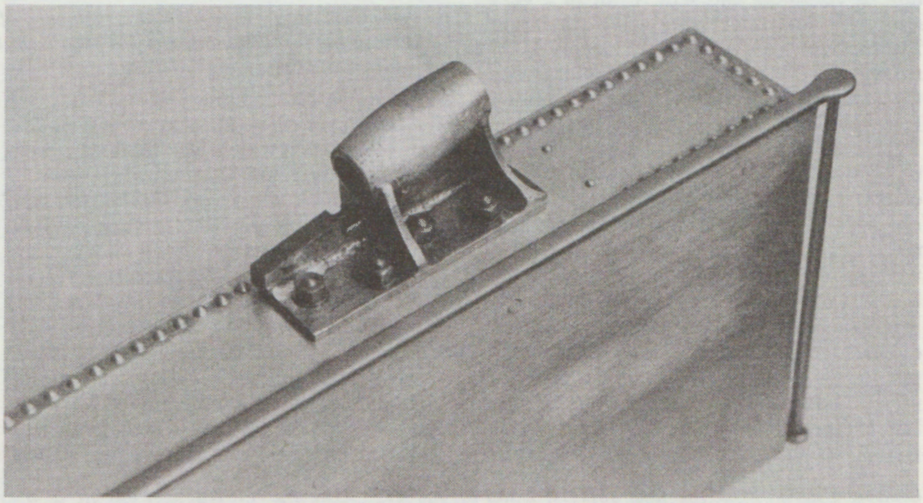
REVERSER SCREW
1 off Stainless Steel & Mild Steel

NUT
1 off Brass
(1/8" thick)

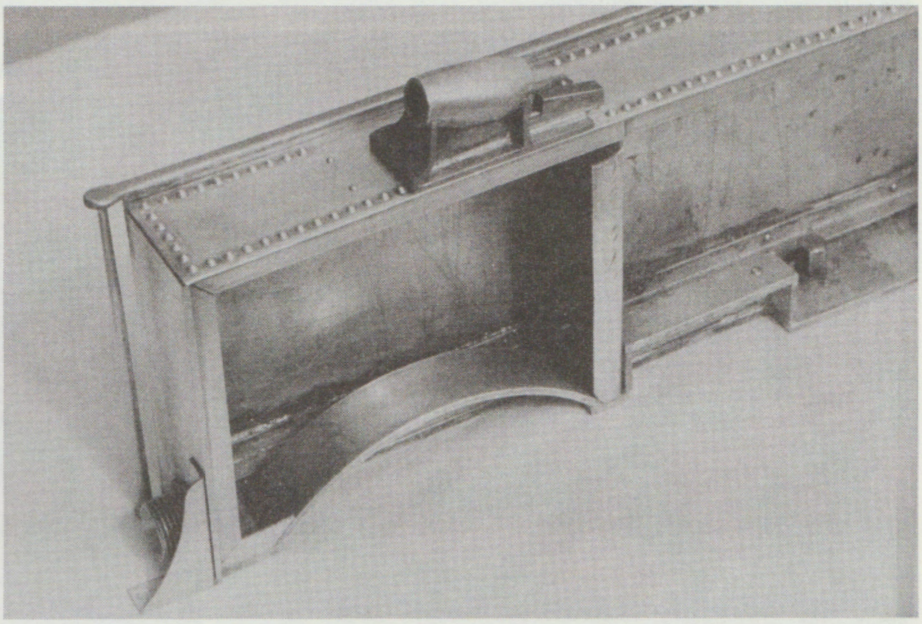
REVERSING NUT
1 off Mild Steel

HAND WHEEL
Mild Steel & Stainless Steel

REVERSER SCREW COMPONENTS



Two views of the left hand side tank showing the reverser 'casting' bolted to the top plate.



STEAM IN AYLESBURY VALE

Reported by Bob Jones
Photographs by Charles Crawley

A group of engines, owners and members of the public in the picnic area within the VAMES track. In the foreground is the 4½" scale Sentinel timber tractor belonging to Jim Davidson of the Harrow & Wembley SME.

'The best yet' was the verdict of everyone who attended the Vale of Aylesbury Model Engineering Society's (VAMES) miniature steam rally over the first weekend in June this year. Quite whether the reason was the promise of unbroken sunshine, when ankle deep water has been known in the past, or ever-increasing popularity, is debatable, but entries were at an all time high with twenty-two engines lined up in the grand parade on the Sunday.

The ninth annual rally was held as usual at the site of the Quainton Railway Society, just north of Aylesbury off the A41. Level ground in the up yard car park is ideal for model steam road vehicles, but many drivers took the opportunity on the Saturday to drive the 400 yards through the site to the VAMES miniature railway station to view the new 7¼" and 5" gauge extension which will be in use later this year. The additional 1,700 ft of track is almost complete and will result in a very enjoyable and interesting drive for larger locomotives. VAMES gives over 20,000 rides every year and is very popular with the general public visiting Quainton Railway Centre.

Now an established event on the miniature steam road vehicle event calendar, the club welcomed back many old favourites and their owners (or is it the other way round?). In addition, there were several new engines this year, some being brand new to the rally circuit.

As usual, the most common traction engines were 4" scale Fosters. As one wag put it, 'as common as Ford Escorts but more robust!' Donald Seal, Arthur Honey, Ian Meikle, Ross Thompson and Terry Baxter all showed fine examples of how this engine can be built.

However, they all acknowledged that the one Foster which was really different was that by John Clarke, who lives 17 miles away. It wasn't until we were asked early on Sunday morning if we had lost an engine that we realised John was coming under his own steam by road! As other drivers arrived, we kept getting reports as to where he was last seen, and he duly arrived soon after 10.30am driving his 4" scale Foster sitting on a very well sprung seat on the trailer. John averaged 6.9 miles per hour for the journey which, even with inflated bicycle tyres around the wheels, is good going. His engine has four speeds with the top speed gear wheels neatly built in between the hornplate and the flywheel and engaged by a separate pin.

Onslow Harris, from the host society, waits on his 4½" scale Burrell traction engine at the level crossing on the approach road to the VAMES track while a visiting 7¼" gauge Romulus passes by.

There were models of Burrell traction engines, of course. Vic Hodge, with his much travelled 'Nellie May', and Roy Saunders, with his well known single crank compound engine, have 4½" scale versions and attend every year, while Onslow Harris brought his nicely finished 1904 version of the Burrell for the first time.

Smaller versions were shown by Malcolm Saytch and Peter Spikings, with their 3" agricultural engines, and Mike Herbert with his tractor styled engine to the same design. Smallest of all was Bob Jones' diminutive gas-fired scenic showman's engine in 1/10 scale.

John Farrington brought his 3" scale Fowler road locomotive and Ray Newman his 2½" scale Fowler showman's engine. Ray was just 'running in' his new boiler for this well known and much admired engine.

Other engines present showed how the variety seems to be growing. Ken Vickers' 2" scale Ruston tractor looked very small when compared with Alan Beasley's 2" scale Fowler Z7S superheated ploughing engine. This engine is incomplete as yet, but it certainly drew a lot of interest. Tony Webster also brought along a 2" scale Durham and North Yorkshire agricultural engine which Tony took on the road run where it performed very well.

Larger engines came in the form of Tony Taylor's well detailed 3" scale Ransomes double crank compound agricultural engine and John Phillips brought

A general view of the model steam road vehicles lined up for the parade, with a rescued full size steam locomotive in the storage sidings of Buckingham Railway Centre in the background.

his 3" scale Caradoc, based on John Haining's design. Although unfinished, it steamed well and has tyres which look as though they will make the engine climb trees. Visitors were challenged to identify the parts of the engine which came from a Volvo brake drum and one of his wife's ornamental vases!

Steam lorries were well represented by Jim Davidson's 4½" scale Sentinel timber tractor and Ian Meikle's recently completed 4" scale Foden wagon looking resplendent in pristine condition. A new design on the list of choices for would-be miniature lorry builders, this one steams as well as it looks.

After the Saturday evening barbecue at the VAMES station, during which time some traction engine drivers tried their hand at driving Tony Taylor's 5" Sweet Pea around the track.

The good weather continued during the Sunday. At noon, thirteen engines set off for the road run into Quainton village and returned happily after replenishing both engines and drivers at the White Swan public house.

Later on, after the grand parade, the prizes were presented to the two owners whose engines had caught the eye of the judges. Ian Meikle won the VAMES trophy for his Foden wagon, with Onslow Harris being runner-up with this 4½" scale Burrell. In between times, drivers happily trundled up, down and around the rally site comparing notes, recounting stories of how they cured this and that, and 'having a go' on friends' engines.

While all this was happening, visiting locomotives were being driven around the present 3½"/5"/7¼" gauge ground level track of 1,400 ft, which runs close by the Quainton standard gauge line, giving a good view of the full size locomotives. A wide variety of engines attended over the weekend, including familiar designs such as Pansy, Sweet Pea, Netta, Simplex, Romulus, Wren, Maid of Kent and Tich, as well as a visiting Bo-Bo electric locomotive.

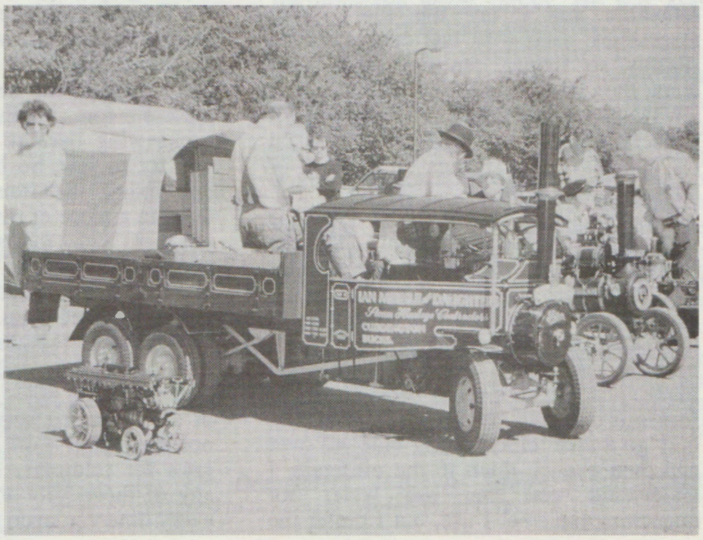
Visitors were also welcomed to the large double track G scale garden railway circuit built over the last two years. The Gauge 1 society also visits this waist-level track, which is becoming increasingly popular with VAMES members.

We now look forward to next year's rally, which will be held at Quainton Road Station on Saturday 30th and Sunday 31st May, 1998. See you there!

Terry Leverett (Theale MTEC) and Ian Meikle (VAMES) present a contrast in Foden wagon size as they trundle past a paused traction engine beside the Buckinghamshire Railway Centre's New York Subway coach body which is now used as a refreshment room.

Steam and smoke as the engines line up for viewing on the Sunday.

A study in contrasting sizes – Ian Meikle's 4" scale Foden wagon stands besides Bob Jones' $^1/_{10}$ scale gas fired showman's engine.



LNER 20 TON BRAKE VAN

Continued from page 119

jaws ground down slightly so that the cutters can cut flush up to an edge.

The curve then has to be put into the spring leaves and for this there is nothing more complicated than a piece of $^{3}/_{8}$" plywood at first cut to a curve somewhere near, but less than, the curve required. I just bend each leaf with my fingers, then lay the leaf on the drawing to see if it is anywhere near the required curve and, if not, carve a bit more off the plywood former until you can bend the spring around the curve on the former and, when released, it should just spring to the curve shown on the drawing. I have a selection of these formers for different types of wagon spring, all of which have been made by my usual trial and error method.

The little buckles to go around the springs are folded up from 6mm × 20 swg steel strip. All I did for this jig was to file the correct sized rectangle on the end of a piece of $^{5}/_{16}$" square steel bar. The jig actually needs to be about $^{5}/_{16}$" × $^{7}/_{32}$" but again, you need to fold a few buckles to make sure that the buckle is tight around the pack of springs. My buckles are open at the back without being silver soldered as nobody can see around there. I assemble all the leaves for one spring by pushing a rivet through the centre holes and then gripping the whole assembly vertically in the vice, leaving just enough room to slide the buckle on. The rivet can then be pulled out and the buckle slid on from the top. I usually have to rest a pair of pliers on the side of the buckle and tap the pliers with a light hammer to force the buckle over the last leaf. The hole can then be drilled through the buckle and the rivet put back in again. This time, snip the rivet to length by using a piece of 2mm plate with a No. 46 hole in it as a guide and rivet up with a snap head on both sides of the spring assembly.

Now, perhaps, the most important item is the hardening and tempering of the spring. What I do is to rest the spring assemblies on a fire brick on the bench, or you can use a brazing hearth if you have one. I have a hearth but no room for it where I am living at present, so I have one lonely old fire brick with four small heaps of coke scattered about on it to act as heat reflectors and I lay the four spring assemblies, each with one end raised up slightly so flames can lick all around them, then heat them to red and quench. I always use rape seed oil (cooking oil) for quenching and then shake the excess oil off and leave the springs on a piece of kitchen towel to drain.

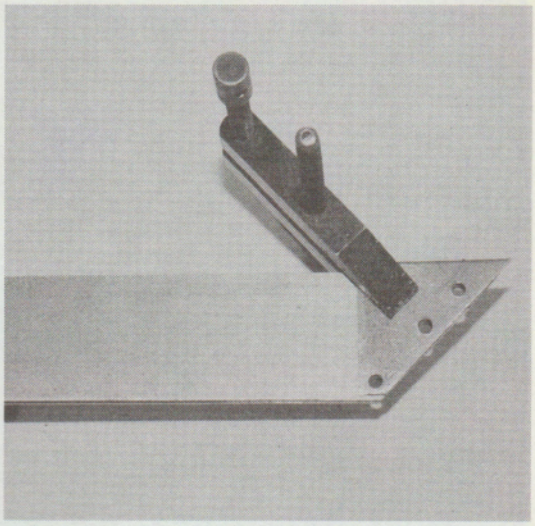
At this stage, **do not** try to bend the springs or they will just snap – I speak from experience! Wipe off the springs with a soft rag and then clean up the top leaves with a piece of fine emery cloth until they are bright(ish) and lay them back on the hearth. Using a fairly small flame, just waft the torch backwards and forwards over and around the springs until they go a nice 'clock spring blue' all over and then quench them in the oil again. I understand you can use water for quenching the steel I use, but I prefer the oil as it penetrates the leaves and they are then lubricated for life. You can now play with the springs to your heart's content!

The other item which I skimped on the description was the making of the small triangular bracket which fits along the outside of the solebars. I have specified 20 swg steel on the drawing, but I didn't have any scraps of the right size, so mine are actually made from 18 swg – it makes little difference. I set out one on an odd scrap of 16 swg plate (to ensure that I didn't use it on the model) and then used that as a template for drilling all the others. I had quite a good stock of nice clean CR4 steel offcuts, so I marked the brackets out in rows (as I needed 24), drilled them all and then cut eight at a time, cleaned them up, folded them and then did the next eight. It does not seem quite such an arduous task doing it that way. To fold mine, I used an offcut of 1" × $^{1}/_{2}$" bright mild steel bar with the ends filed dead square. The first fold can be done in the vice fitted with soft jaws, but I found it easier to use the block of steel to make the second fold to get the corner at right angles.

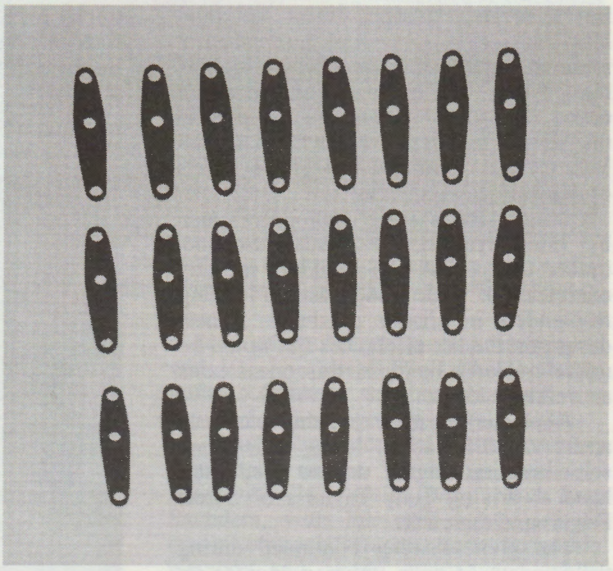
Mentioning the soft vice jaws reminds me of a tip a toolmaker friend of mine gave me a while back. When you buy a new vice, make sure you buy the best that money can buy as most of the cheap ones you see for sale on a lot of the trade stands at our exhibitions are just that, cheap. You can find the odd good one if you look carefully but nine out of ten vices that I have looked through have jaws which are anything up to $^{1}/_{16}$" out of parallel!

The big mistake that I made when buying my last vice was that it was one of the above described, and it only has a two bolt fixing to the bench. It is absolutely useless for holding steel bar for hacksawing because the vice judders as you try to saw. So buy one with a three bolt fixing, then remove the jaws, wrap them in a piece of rust inhibitor paper and put them away in a safe place. It will not matter if you can't find them again because, for the sort of work we do, you will never need them.

Now take two pieces of ordinary mild steel bar of the same section as the jaws, drill the fixing holes and fit those in place of the discarded jaws. This way you will not mark your work and you can use the jaws for folding. Also, you won't have any of those silly soft jaws that fall out every time you open the vice.



Using a template for drilling all the brake links in an offcut of 18 swg CR4 steel. The offcut was too narrow to mark the links square across, hence the angle.



The three sets of completed links drilled and filed to shape.

If, when you have fitted the jaws, you find they are slightly out of alignment, you can run a fine file along the top of the jaws to square them up and make a square edge. Once they have a few file marks on them or, if like me you use the jaws as a sawing guide, you can soon clean them up and make a fresh start again. With soft jaws made out of anything other than steel, it is difficult to obtain a nice clean and square arriss for folding. I do have a pair of folding bars for larger items made from two lengths of 1" × 1" × $^{1}/_{8}$" angle, joined at one end with a loop of $^{3}/_{8}$" × $^{1}/_{8}$" flat mild steel.

One small thing I have noticed is that the part cross section of the outer longitudinal on page 10 of the July issue of *Engineering in Miniature* shows a dimension of $^{17}/_{32}$" to the centre line and this should, of course, be $^{21}/_{32}$" which alters the outreach of the brake hanger.

Next month I will report on this year's two Gilling Main Line Weekend events to give me time to catch up a little, and also to show some of the super new model wagons which keep turning up at these events. After that we should be able to make a start on the bodywork.

To be continued.

THE EARLY DEVELOPMENT OF THE STEAM ENGINE

by David Hulse

Fig 85: The Reverend Jean Theophile Desaguliers Li.D., F.R.S.

Part Twenty-four

Desaguliers

The one person who is inextricably linked with the documentation of early atmospheric engines is the Reverend Jean Theophile Desaguliers (1683-1744). In 1744, Desaguliers published a work which was to become a classic document for early engine research, entitled *A Course in Experimental Philosophy*. The tome contains many engine drawings showing the most intricate of details which, when put together, would make an early atmospheric engine.

Desaguliers came to London in 1713 and quickly established himself by befriending the scientific thinkers of the day. In 1716 he exchanged ideas with Marten Triewald and neither of these men were able to disguise their jealous thoughts towards Thomas Newcomen's achievements.

Desaguliers states in his book that if he had thought of creating a vacuum by the condensation of steam before Thomas Newcomen, he would have had a better understanding of the principles involved, and would have made a better fire powered engine. He did not give Thomas Newcomen any credit for his discovery, agreeing with Marten Triewald that it was most likely the result of an accident.

Desaguliers was made a Fellow of the Royal Society and is said to have been an impressive teacher and lecturer who became the Society's curator of experiments. He was chaplin to His Royal Highness Frederick, Prince of Wales, and also to the wealthy James Brydges (Earl of Carnarvon) at whose house, Cannons, near Edgware, he designed and installed the domestic water supply. He was also Grand Master of the Freemasons.

Desaguliers' contribution to steam engineering may have been modest, but he has had a great influence through his writings. He made many attempts to perfect the Savery principle of drawing water by the combined forces of a vacuum and the expansive power of steam. His attempts were mainly designed for the wealthy, who used the Savery machine to pump water for their garden fountains. A drawing of one such installation is shown in figure 86.

In 1718 Desaguliers befriended Henry Beighton, who had been responsible for the engraving of the Griff engine built in 1714. The two men had a good

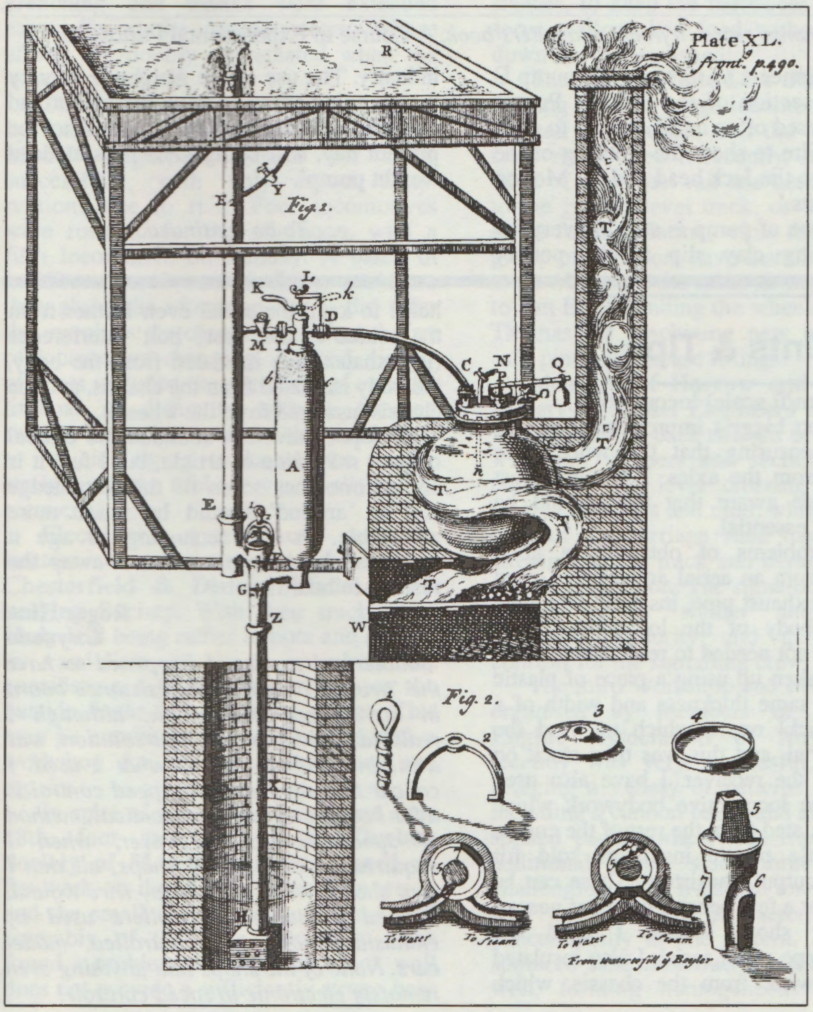


Fig 86: Desaguliers' improved Savery engine (1718) designed to ornament garden fountains.

understanding of scientific principles and worked well together.

Figure 75, which was illustrated in Part 20 of this series (*Engineering in Miniature*, June 1997), is from Desaguliers' *A Course in Experimental Philosophy*, but a close study will reveal that it is a tracing from Beighton's earlier drawing of the Griff engine. The drawing in Desaguliers' book is of an engine thought to have been assembled on the Oxclose site. By tracing the earlier drawing, the artist has reversed the image. The only dimensional difference between the two drawings is that the gable walls on the later drawing are two feet further apart. There has also been a modification to the principle of the valve operating mechanism on this drawing. All the other dimensions of the drawing are identical; they even have the same number of layers of bricks in each gable wall. The artist producing this second illustration must have thought the country scene was too tedious to reproduce and did not include it in Desaguliers' book.

Most of the drawings showing atmospheric engines up to about the year 1725 seem to be a variation on Henry Beighton's drawings of the Griff engine. They all possess the well-dressed gentleman viewing the country scene beyond the pump rods as they descend into the mine workings below.

Illustrated in his book, Desaguilers shows the typical type of plunger pump that was used with these early atmospheric pumping engines. Figure 87 shows two pumps redrawn from Desaguliers' book. Pump A was used for ornamental fountains where the suction lift was usually small, the only requirements being a very pleasing visual column of water. An accumulator, marked H, was stated as an 'Air Vessel to joyn to any Conduct pipe after the Forcing Valve.'

Pump B was a plunger pump invented by Sir Samuel Morland (1625-1695) and was the type used for mine drainage by the early pioneers. A reference to pump B states, 'A section of the Forcing Pumps such as is used often in the Engine to raise Water by Fire to show the working of the Plunger thro the Jack head and the Motion of the Valves.'

This type of pump is still in everyday use pumping clay slip in the pottery industry. The use of the weights F to vary the pumping pressure gave these Morland devices a name that has endured to the present day, still being known as a 'dead weight pump'.

To be continued.

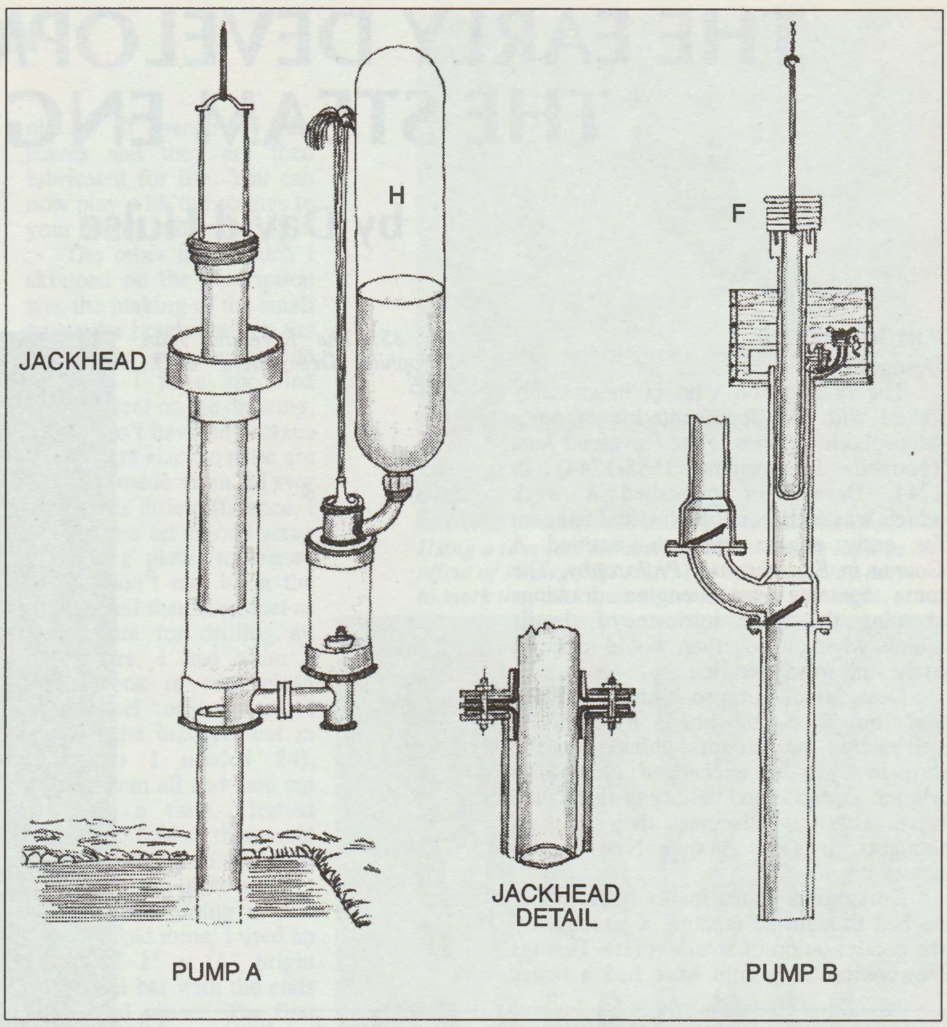


Fig 87: Two pumps redrawn from Desaguliers' book, A Course in Experimental Philosophy.

Readers' Letters . . . Hints & Tips

Dear Sir

It was, as usual, a pleasure to receive the latest issue of *Engineering in Miniature*. However, not for the first time, I find myself amazed at some of the things written about radio control of battery locomotives. I have had several years' experience in this field, having only recently sold my previous business of Friog Models which specialises in battery powered diesel outline 16mm scale models.

One of the first things to do is to throw away the resistance type controller – they just waste battery power by heating the resistances. Use a commercial speed controller with a decent transistor output stage which will waste no energy to speak of. A Scottish firm called Antenna Models produce a beautiful glitch free controller that has only four wires to connect plus the receiver plug to push in! I cannot recommend this unit enough and it is small enough to fit into most models, as it is sold mainly for 'O' gauge (7mm/ft scale) locomotives.

The next biggest improvement can be made by ensuring that the wheels are insulated from the axles. I thought most people were aware that this should be considered essential.

The problems of obtaining a good reception from an aerial are many! I used to use the exhaust pipe, insulating the pipe from the body of the locomotive. Any aerial wire not needed to reach the exhaust pipe was taken up using a piece of plastic (about the same thickness and width of a lollipop stick) on to which to wind the surplus aerial, and this was then stuck on the top of the receiver. I have also used parts of the locomotive bodywork which can be insulated from the rest of the engine by the little plastic insulators sold for mounting output transistors. These can be obtained for a few pence from your nearest electronics shop. Where I used the 'exhaust' pipe as an aerial, I also insulated the body work from the chassis, which helps to keep the aerial even further from the source of the 'rusty bolt' interference (ie, exhaust pipe insulated from the body, the body insulated from the chassis, and the chassis insulated from the wheels).

I hope I have not sounded too critical of your magazine or article, but I feel it is about time that some of the knowledge that is 'around' should be made more accessible. In this technological age it really is about time we threw away the resistance board!

Roger Hine
Gwynedd

'Southerner' replies: I happened to have the 'printed circuit' type resistance board in my spares box which, although I realised it was not the best solution, was available and so this is what I used. I concur that an electronic speed control is a far better, and more economical, method of speed control. However, when I enquired at local model shops, all that I was shown were the cheap, wire-wound, stepped resistance controllers used by enthusiasts of radio-controlled model cars. None of the shops had anything even remotely electronic in speed controls!

CLUB NEWSROUND

The signal box extension has now been completed by Dave Simmonite and the 'Tuesday Team' of **Ascot Locomotive Society** and is now the society's workshop. Improvements to point rodding by Dave Bailey have been completed, while John Brotherton has taken on the task of installing a stop signal to protect the turnout at Henry's Halt layback siding. Ducting for the power cables has been located and selected for the cable run to the siding. The electrical shunt ahead signals on the start semaphores have been remounted to improve their durability and members are considering fitting proper hoods to give them a realistic appearance.

Despite the old proverb 'Rain before seven, fine by eleven', members of **Bradford Model Engineering Society** had a very wet morning for their Open Day held on the 15th June. The club's first train ran only two minutes late from the advertised time, although there was a distinct lack of passengers. Several locomotives were steamed despite the weather, with plastic sheets covering the steaming bays to keep off the rain. As the morning progressed, the weather slowly improved, but it was not until after lunch that the weather dried up and passengers became more plentiful. However, everyone enjoyed themselves despite the drenching and thanks were extended especially to the catering team, whose efforts are doubly appreciated when the weather is unkind.

The public running day held on June 8 by members of **Cheltenham Society of Model Engineers** passed off quite successfully, with only minor interruptions due to rain. Four locomotives were rostered for the afternoon, with a fifth locomotive on standby. A batch of indifferent coal caused firing problems throughout the afternoon, but it did offer the members the chance to perfect the art of locomotive changing. A good display of boats included the spectacle of a model lifeboat in difficulty with a jammed rudder. The other craft on the pond went to its aid, trying to knock the rudder straight and the lifeboat was finally safely recovered.

Electricity, water and sewerage matters are concerning the members of **Chesterfield & District Model Engineering Society.** With their tracksite at Hady Hill being rather remote and subject to vandalism at times, members are considering a toilet block which, on the outside, looks like a normal garage. This may be combined in one building with a workshop for on-site maintenance and repairs.

In spite of a bitterly cold day on June 18th, four members of the **Durban Society of Model Engineers** turned up for work on the flex-traverser conversion and the small swing transfer unit. A trial assembly of the long pneumatic rams found a problem – the breeze block wall does not provide a sufficiently strong base for mounting the pneumatic cylinder and a concrete foundation will be constructed within the wall. The swing transfer unit was modified by incorporating a roller running on tracks to support the overhang, together with a locating bolt. Trains will now run smoothly and safely over this section of the loop line.

Shuttering and concrete casting has been started by members of **Erewash Valley Model Engineering Society** for the ground level track tunnel at their Borrowash tracksite, but progress is rather slow due to the many hours involved in keeping the 'jungle' in check. A special 'thank you' goes to Geoff Mansfield for all his work in wiring up lights and sockets, and fitting brackets and shelves wherever required. These items of work may appear small, but they weren't done the members would be greatly inconvenienced.

The club barbecue was held by members of the **Frimley & Ascot Locomotive Club** on June 21, though it rained non-stop and a temporary shelter had to be erected hastily. Several members who had brought their engines were determined not to let the rain spoil their fun and kept going regardless. Special thanks go to the members who managed, under very difficult circumstances, to keep the barbecues alight and serve well cooked food without burning down the carriage shed!

The **Golden Gate Live Steamers** are looking for 3½" gauge locomotives to run on their raised track, after the 'high track' crew refurbished it recently. Meanwhile, 40 ft of new steel rail has been delivered to the ground level track, or 'low track', ready for installation, while the Thursday group of members have installed replacement wheels on the main turntable, thanks to Jim Boyer finding the wheels and Dick Thomas for machining new bushes and axle pins with grease fittings.

Members of **Harrow and Wembley Society of Model Engineers** have relaid virtually all the back straight of their track with new sleepers and sections of new trackbed. The level crossing has been cleared of debris and mud, while the inner road of the carriage shed has also had attention to the track and derailments are now less common. The signalbox now has a new roller shutter and glazing, improving security and giving more comfort for the signalling crew.

The third Workshop and Foundry Day organised by members of the **Heat Engine Association of Nova Scotia** recently was very successful, members bringing a variety of patterns to be cast including a cannon barrel and side frames, spoked paddle wheel side frames, some additional stock side frames, and a challenging set of front and rear rims, plus the two hubs, for a tractor, all done concentrically in one pattern. The newly acquired sand mixer/aerator worked very well, forming homogeneous and light foundry sand quickly and efficiently.

With the grand opening of the Broomy Hill Railway of the **Hereford Society of Model Engineers** on 31st August successfully concluded, members are now concentrating their efforts on completing the ground level track extension. Signalling is planned for the ground level track, with both signals and points being controlled pneumatically, and members are being asked for their views on the project at a 'workshop' meeting about signalling principles to be held on the 9th January 1998.

A scale 'running to timetable' event is being considered by members of **Hornsby Model Engineers Co-operative**. It is intended to hold the first trial event in November 1997 and all members with scale locomotives and/or rolling stock are invited to attend. Other members will also be welcome to perform as ground staff such as yardmasters, signalmen, pointsmen and shunters.

The temptation to rush into ground level railway construction by members of the **Isle of Wight Model Engineering Society** is being resisted in the interests of improving access to the Broadfields, Cowes, site and building a carriage shed. The access improvements propose a drawbridge across the railway plus outward opening gates and a concrete ramp to enable vehicles and trailers to be brought on site, while the carriage shed will serve both ground level and raised tracks and will be sited just behind 'Salter's Halt'.

Vandals have struck at the track of **Leicester Society of Model Engineers** recently. All four doors of the station were wrecked and the fire extinguisher was let off inside the building. Members soon secured the building and four steel doors have now been made. All the repair work has set everything back by about a month, including the stock shed bunker which is now ready for the concrete roof to be poured and the doors hung. The society has been donated a huge heap of *Polyanthus* plants by the Council, of which at least 600 have been placed around the track. However, it required an enormous effort to keep the plants watered during the drought earlier this year and a novel idea for watering was introduced – carrying two watering cans on each passenger train and emptying them over the plants as they passed by.

On the 6th July, the very first engine was turned by members of **Milton Keynes Model Engineering Society** on their newly built turntable at the Kingfisher tracksite. Both 5" and 7" gauge locomotives can now be turned, with the locking mechanism and push bars in place. Members are reminded that they should always *push* a turntable, never pull it round, so that should you slip and fall over, the turntable will move away from you.

The operator's pit for the boating pool

for members of the **North London Society of Model Engineers** is almost finished, the grass by the pond has been cut and the water is crystal clear with fish well in evidence. A few patches of algae have begun to grow, but it is not expected to be a nuisance this year.

The annual exhibition held by members of **South Durham Society of Model Engineers** took place on 15th June to coincide with the Hurworth Grange gala day. The Brian Swales Trophy (best model in the exhibition) went to Geoff Fearnley for his Class 08 diesel shunter. This model also claimed the Percy Reid Trophy (best exhibit that has not yet gained an award). The Stan Porritt Trophy (best unfinished exhibit) was won by Brian Owens for this Chubb locomotive, while the Longstaffe Shield (best exhibit which is not a model) also went to Brian Owens for his Grasshopper skeleton clock. The Jim Flowers Remembrance Trophy (best model in steam) went to Cliff Barratt for his 'Mountaineer' locomotive, while the David Walton Plaque (best exhibit not to a published design) went to Brian Owens for his slanting shaft ploughing engine.

Six members of **Stamford Model Engineering Society** cleared most of the mud and much of the intruding vegetation from beneath the track and steaming bays at their Witham Hill School, Lincolnshire tracksite in July, in readiness for their August track meeting.

The annual Open Weekend of **Strathaven Model Society** will take place this year on 11th/12th October at their tracksite in Strathaven Park, Strathaven, Lanarkshire. The society has a 5"/7¼" gauge ground level track with a minimum radius of 35 ft, so large standard gauge model locomotives may have some difficulty traversing the curves, but a Royal Scot locomotive will run without any problems. There is also a 2½"/3½"/5" gauge raised track. If you wish to bring your steam locomotive, you must have a current boiler certificate and club membership card. Hot food will be available throughout the weekend. It would be appreciated if an indication of the numbers of people planning to attend could be notified to Mr M I Thomas, telephone (01475) 674057, by the 30th September 1997 at the latest so that the catering can be arranged to suit.

All correspondence to **Taunton Model Engineers** should now go to Andy Cooke who has taken over the position of secretary. He may be contacted at 19 Barrow Drive, Taunton TA1 2UU, telephone 01823 277255. Meanwhile, the present headquarters in Vivary Park have become decidedly cramped on club nights. Hopefully, a new tracksite can be found where meetings can be held in more comfort and a larger track built.

Members of **Vancouver Island Model Engineers** held their 25th Anniversay Meet at their tracksite at the Saanich Historical Artifacts Society grounds from the 30th August to the 1st September. The historical society offered the use of the rooms in their 1912 schoolhouse, in the process of being refurbished, for the display of stationary engines and other models. which was gratefully accepted as the ultimate in weatherproofing and security.

Diary October

Details for inclusion in this diary must be received **at least** EIGHT weeks prior to publication. Please ensure that full information is given, including the *full address* of where every event is being held. Whilst every possible care is taken in compiling this diary, we cannot accept responsibility for any errors.

EVENTS OF INTEREST TO MODEL ENGINEERS

A comprehensive list of steam rallies and other preservation events can be found in the *Steam Heritage Museums and Rally Guide 1997/8*, available from TEE Publishing, price £3.50 including postage.

1	Bradford MES, 'Indian Narrow Gauge' and 'Stern Wheelers', Slide show by John Holroyd, Saltaire Methodist Church, Saltaire, Shipley, West Yorkshire.
2	Leyland SME, 'The Saundersfoot Railway', Talk by Alan Priddey, The Conservative Club, Towngate, Leyland, Lancashire.
2	Sutton MEC, Bits & Pieces Evening, rear of 1 Chatham Close, Sutton, Surrey.
2	Whitchurch (Cardiff) & District MES, 'Railway Recollections', Talk by Cyril Chandler, Heath Park, Cardiff, South Glamorgan.
3	North London SME, 'Inland Waterways', Slide show and talk by Roger Davies, Headquarters Building, Legion Way, Summers Lane, North Finchley, London.
3	North Norfolk MEC, AGM, Social Centre, Avenue Rd, High Kelling, Holt, Norfolk.
3	Rochdale SMEE, AGM, Castleton Community Centre, Manchester Road, Castleton, Rochdale, Lancashire.
4	Birmingham SME, Midland Federation Meeting, Illshaw Heath Road, Hockley Heath, West Midlands.
4	North West Leicester MES, Club Birthday and Night Run, Hermitage Recreation Ground, Hermitage Road, Whitwick, Leicestershire.
4	SMEE, 'Early Experiments in Electricity', Talk and demonstration by Chris Dyos, Marshall House, 28 Wanless Road, London SE24.
4/5	Urmston & District MES, Open Weekend, Abbotsfield Park, Chassen Road, Flixton, Urmston, Manchester.
5	Brighouse & Halifax ME, Open Day, 'Ravensprings', Cawcliffe Road, Brighouse, West Yorkshire.
5	Cambridge Museum of Technology, Model Railway Day, The Old Pumping Station, Cheddars Lane, Cambridge CB5 8LD.
5	Romney Marsh MES, Autumn Track & Garden Rail Meeting, 101 Rolfe Lane, New Romney, Kent.
6	Peterborough SME, Bits & Pieces Evening, Thorpe Hall, Longthorpe, Peterborough, Cambridgeshire.
7	Romney Marsh MES, Bits & Pieces/Bring & Buy Evening, Methodist Church Hall, New Romney, Kent.
7	Taunton ME, 'Building a New Loco', Talk by John MacDougal of Peco, Vivary Park, Taunton, Somerset.
8	Hull & District SMEE, 'Cross Fertilisation', Talk by C Parsons, YPI Centre, Chanterlands Avenue, Hull, North Humberside.
9	Brighton & Hove SMLE, Workshop Evening, Woodland Drive entrance to Hove Park, Hove, Sussex.
9	North West Leicester MES, 'Railways at War', Talk by Mr Webster, Coalville Labour Club, Bridge Road, Coalville, Leicestershire.
9	Whitchurch (Cardiff) & District MES, Bits & Pieces Evening, Heath Park, Cardiff, South Glamorgan.
10	Hereford SME, 'Tramways and Light Railways', Talk by David Voice, Royal College for the Blind, Venn's Lane, Hereford.
10	North London SME, 'Building Steam Locomotives', Discussion evening led by Brendan Corcoran, Headquarters Building, Legion Way, Summers Lane, North Finchley, London.
11	West Riding SLS, Half Yearly General Meeting, Freedom House Annex, Unison House, Bradford Road, Tingley, Wakefield, West Yorkshire.
11/12	Malden & District SME, 7¼" Gauge Weekend, Claygate Lane, Thames Ditton, Surrey.
11/12	Strathaven MS, Open Weekend, Strathavon Park Miniature Railway, Strathaven, Lanarkshire.
12	Cambridge MES, Public Open Day, Fulbrooke Road, off Grantchester Road, Cambridge.
12	Keighley & District MES, Open Day, King George V Playing Fields, Marley, Keighley, West Yorkshire.
12	Leyland SME, Diesel/Electric Day, Worden Park, Leyland, Lancashire.
14	Dockland & East London MES, AGM, Belhus Woods Country Park Visitors Centre, Aveley, Essex.
14	Sutton Coldfield MES, 'Steam Boats', Talk by Trevor Milnes, Wylde Green Library, Wylde Green, Sutton Coldfield, West Midlands.
15	West Riding SLS, Bits & Pieces Sale, Freedom House Annex, Unison House, Bradford Road, Tingley, near Wakefield, West Yorkshire.
16	Leyland SME, Quiz Night, The Conservative Club, Towngate, Leyland, Lancashire.
18	Ascot LS, First Steam-Up in the Dark, Ascot Racecourse, Berkshire.
18	National 2½" Gauge Association, Hook Get Together, St Paul's Church Centre, Hook, Chessington, Surrey.
18/19	Eastleigh Lakeside Railway, Open Weekend, off Wide Lane (close to M3/M27), Eastleigh, Hampshire.
18-25	**MIDLANDS MODEL ENGINEERING EXHIBITION, International Exhibition Centre, Donington Park, near Derby.**
19	Sandtoft Miniature Railway, 'Yorkshire Day', Sandtoft Transport Centre, Belton Road, Sandtoft, near Doncaster, South Yorkshire.
19	Whitchurch (Cardiff) & District MES, Open Day, Heath Park, Cardiff, South Glamorgan.
20	Peterborough SME, AGM followed by Junk Sale, Thorpe Hall, Longthorpe, Peterborough, Cambridgeshire.
21	Chesterfield & District MES, Photographic Competition, Friends Meeting House, Ashgate Road, Chesterfield, Derbyshire.
21	Romney Marsh MES, 'Trains Across the Channel', Talk by Gerald Siviour, Methodist Church Hall, New Romney, Kent.
21	Taunton ME, 'Looking for the Perfect Contact', Talk by David Hartland, Bishop Henderson School, Galmington, Taunton, Somerset.
22	Hull & District SMEE, 'Our Own Devices', Talk by A Finn, YPI Centre, Chanterlands Avenue, Hull, North Humberside.
23	Brighton & Hove SMLE, Workshop Evening, Woodland Drive entrance to Hove Park, Hove, Sussex.
23	Whitchurch (Cardiff) & District MES, AGM, Heath Park, Cardiff, South Glamorgan.
25	Guildford MES, Night Run and Halloween Barbecue, Stoke Park, Guildford, Surrey.
28	Stafford & District MES, 'The Cromford & High Peak Railway – Part 2', Talk by Alan Rimmer, Varity Perkins Social Club, Tixall Road, Stafford.
28	Sutton Coldfield MES, Auction Sale, Wylde Green Library, Wylde Green, Sutton Coldfield, West Midlands.
30	Leyland SME, Auction Night, The Conservative Club, Towngate, Leyland, Lancashire.
30	Whitchurch (Cardiff) & District MES, 'History of Aviation', Talk by Geoff Wadams, Heath Park, Cardiff, South Glamorgan.
31	Hereford SME, 'Boiler Making', Talk by John Jones, Royal College for the Blind, Venn's Lane, Hereford.

EIM CLASSIFIED ADVERTISEMENTS

Telephone:
01926 614101

Rates:
ALL CLASSIFIED ADVERTISEMENTS MUST BE PREPAID
Display Box rate £10.50 for scc (plus VAT) (min 2.5cm)
Classified lineage 70p per word (inc. VAT) (min 20 words)

ALL ADVERTISEMENTS SUBJECT TO 17½% VAT

Advertisements will be published in the first available issue. Copy date six weeks prior to publication. The Publishers reserve the right to refuse advertisements without giving reason. Every care is taken to avoid mistakes, but the publishers cannot be held liable in any way for errors or omissions. Receipt of copy for publication implies acceptance of these conditions by the advertiser. Whilst every care is taken to exclude advertisements from doubtful sources, no responsibility can be accepted by the Publishers for the bona fides of advertisers. Advertisers are reminded to keep in mind the provisions of the Trades Descriptions Act, and to avoid any misrepresentation of goods offered for supply. It is also important to note that the Business Advertisements (Disclosure) order 1977, is in force. This order requires all who seek goods in the cause of a business to indicate this clearly in the advertisement. Advertisers are expected to acknowledge all enquiries that enclose a s.a.e. If a reply is required to any enquiry arising from advertisement, a stamped and addressed envelope should be enclosed.

MODELS & MATERIALS

LIVE STEAM MODELS
Traction Engine Specialists
Drawings and Castings 3" to 6" scales
Catalogue" £2.50 U.K. and £3.50 overseas.
Unit 7, Old Hall Mills,
Little Eaton, Derby DE2 5DN
Tel: (01332) 830811
Fax: (01332) 830050

MECCANO
SPARE PARTS
Sets and model building literature
Widest range and availability, free lists.
Retail and Mail Order. Access and Visa cards.
M W MODELS "Everything Meccano"
4 Grays Road, Henley-on-Thames, Oxon RG9 1RY
Telephone (01491) 572436
Answerphone service outside office hours
FAX Your Order! (01491) 571175

MACC MODEL ENGINEERS SUPPLIERS
45A Saville Street, Macclesfield SK11 7LF
Tel: 01625 433938
Stuart Models – Nu-Tool – Materials
Phosphor Bronze 102 and Colphos 90
Free Machining Phosphor Bronze
Round 1/8"-2", Hex. Colphos 5/32"-1/2"
Steam Fittings – Taps. Dies. Flats. etc.
9am – 5.30pm. Late Night Thursday

HITECH GEAR & ENG. CO.
Low cost gear cutting & machining to your requirements. Send drawings or tel. Jim for prompt quote.
Unit L, Adamson Industrial Estate, Croft Street, Hyde, Cheshire SK14 1EF
Tel. or fax: (0161) 367 9404
Mobile: (0421) 379255

WELSH DRY STEAM COAL
WASHED STEAM COAL
DIRECT FROM OUR
SOUTH WALES MINE
Pre-Packed in
Convenient 20Kg Bags
AVAILABLE AT THE
MIDLANDS
MODEL ENGINEERING
EXHIBITION,
***OR* Pre-Order to avoid disappointment**
Beans (12 × 22mm nominal sizing)
@ £3.50 per bag
Small Nuts (22 × 45mm nominal
sizing) @ £3.85 per bag
Please contact:
DAVID SUTTON
(SIGNAL FUELS PRE-PACKED)
Tel/Fax (01204) 300444
Mobile (0802) 721537

MATERIALS, CASTINGS & PLANS

BA SCREW STOCKIST – OVER 300 SIZES IN STOCK
STEEL: Round head : Cheese head : Countersunk head : Hexagon head standard or small
BRASS: Round head : Cheese head : Countersunk head : Hexagon head standard
Also Tools, Taps & Dies (BA & ME), Drills: Metric, Number and Letter, Split Pins, Roll Pins, Full and Thin Nuts, Dome Nuts, Socket grubs, Socket Countersunk, Socket Caps, Stainless Cheese, Countersunk and Round, Studding, Brass Round, Angle, Square & Hexagon, Phosphor Bronze PB102 Round and Hexagon, Brass, Copper and Steel Rivets.
Postage at cost and no packing charge on orders over £5 EXCLUDING POSTAGE
E-mail LIST AVAILABLE FREE or send SAE plus 50p in stanps (overseas £1.50) for 28 page list to:
'ITEMS' MAIL ORDER LTD (Dept EIM)
46 St Martins Road, North Leverton,
Retford, Notts. DN22 0AU
Tel/Fax 01427 880827 E-mail: items@btinternet.com

THE MINIATURE RAILWAY SUPPLY CO. LTD.
7¼" Track materials for passenger carrying miniature railways from 3½" gauge through to 15" gauge. **10¼"**
We can offer a range of Steel and Alloy Flat bottomed rail sections plus sleepers, wood or steel, together with a range of fittings. Pointwork, complete or in kit form together with turntables also available.
42 Stratford Way, Boxmoor, Hemel Hempstead, Herts. HP3 9AS
Telephone/Answerphone/Fax 01442 214702
Mobilephone 0836 755738. Evening calls welcomed.

FYNE FORT FITTINGS
(Freshwater, IOW)
The Steam Fitting Specialists
Clarence Boatyard, East Cowes,
Isle of Wight, UK PO32 6EZ
Tel.: 01983 293633
List still free, send SAE

FERROUS AND NON FERROUS CASTINGS made to order. Contact Manor Brass Unit, 52 Trent Road, Boughton Industrial Estate, New Ollerton, Notts. NG22 9ZB. Tel/Fax (01623) 863069, evenings (01623) 824684.

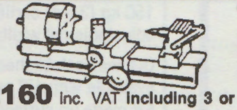
PROFESSIONAL MODEL ENGINEER builds, repairs stock, 3½", 5", 7¼", NG, standard, kit, scratch. Reasonable rates, no VAT. Tel. (01278) 732896.

THE STEELSTORE
Bright & Silver Steel, Copper, Brass, Ali,
P/Bronze, Stainless.
9" × 4" s.a.e. for lists.
Open Tues., Thurs., Fri., 10.00-4.00, closed 12.30-1.30.
Some Sats. 10.00-1.00, ring to check.
Northbrook Farm, Unit 7,
Titnore Lane, Goring, Worthing, BN12 6NY.
Mobile phone 0958 215297.

SOCKET HEAD SCREWS

Cap. C/Sunk. Button. Set. Shoulder
Metric. BA. BSF. BSW. UNF. UNC.
QUANTITY DISCOUNTS
Send 4 first class stamps for catalogue
Emkay Supplies (EIM) 74 Pepys Way,
Rochester, Kent ME2 3LL
Tel. 01634 717256 *Mail order only.*

WORKSHOP EQUIPMENT



THE PEATOL LATHE

£160 inc. VAT **including 3 or 4 jaw chuck.** Milling attachment and other accessories available, centre height 2¼", distance between centres 9¾". Please send 2 second class stamps for details. **Peatol Machine Tools, Dept 2, 19 Knightlow Road, Harborne, Birmingham B17 8PS.**

WORKSHOP EQUIPMENT

WANTED: Complete home workshop, especially with Myford Series 7 or similar lathe. Also looking for a milling machine and bench drill. Sensible prices paid with immediate settlement. Will travel. Tel. Nottm. (0115) 9393053 (evenings only). (T)

R. A. ATKINS LTD.
MAIN MYFORD STOCKISTS
SERIES 7, 254 PLUS AND VM-C MILL
SEND S.A.E. FOR NEW AND USED LIST
Purchase and Valuation workshops
Hunts Hill House, Hunts Hill, Normandy,
Guildford, Surrey GU3 2AH
Tel: Guildford (01483) 811146

PHASE CONVERTERS AND TRANSFORMERS
SINGLE PHASE TO THREE PHASE manufactured to your personal requirements from £50
TRANSFORMERS, single or three phase 25va up to 100kva any voltage. From £10
ELECTRIC MOTORS REPAIRED FROM £60
Send SAE or call **JMS Manufacturing, 26 Partridge Grove, Werrington, Peterborough, Cambs. PE4 5BA**
Tel. 01733 370006 Mobile 04687 68791

LATHE ACCESSORIES

- Rear Tool Post
- George Thomas's Boring Head
- Collet Chuck
- Keyway Slotting Attachment
- George Thomas's Versatile Dividing Head
- Knurling Tool
- Headstock Dividing Attachment
- Taper Turning Attachment
- Machine Screw Cutting Gearbox
- Between Centres Boring Bars
- Graduating Tool
- Spherical Turning Tool
- Screw Cutting Gearbox
- Spotting Tool
- Hand Turning Rest
- Retracting Top Slide
- Poly V Belt Conversion for S7
- Dr Beddard's Small Boring Head up to 1" diameter capacity
- Dr Beddard's Large Boring Head 3/4" - 6" diameter capacity

Send £2.50 for our new A4 Workshop Catalogue/binder

Hemingway
Wadworth House, Greens Lane, Burstwick, Hull HU12 9EY
Tel: 01964 670701

the Spares Counter
at MYFORD LIMITED
Wilmot Lane, Chilwell Road,
Beeston, Nottingham NG9 1ER
Tel: (0115) 925 4222
The Factory Shop, for all your Myford spares and accessories. Where we stock a large selection of Rexon drills and belt sanders, along with an expanding range of general engineering equipment, tools and materials, all at **competitive prices.**
Open Mon-Fri: 8.30am-12.30 pm and 1.30pm-4.30pm
Most Saturday mornings 9.00am-12.30pm

IF YOU wish to sell your surplus machinery, accessories or complete workshop in a confidential, no fuss manner with immediate settlement, then please contact David Anchell at Quillstar Ltd, Lower Regent St, Beeston, Nottingham NG9 2DJ. Tel. (0115) 255944, fax (0115) 9430858.

Please mention ENGINEERING IN MINIATURE when writing to advertisers

Established 1950

GRAHAM ENGINEERING [Midlands] ltd

Machinery, Cutting and Precision Tool Suppliers

Alpine House
Roebuck Lane, West
Bromwich
West Midlands B70 6QP
England
Telephone: 0121 525 3133
Facsimile: 0121 500 6453

OCTOBER EXTRAVAGANZA

GRAND OPEN WEEK

WEDNESDAY 1ST TO SATURDAY 11TH OCTOBER

10.00am to 4.00pm

NEW & USED ITEMS

EST. 47 YEARS

EACH DAY A FREE GOODY BAG WORTH £10
TO THE FIRST 10 CUSTOMERS SPENDING £20 OR MORE

ONE OFF BARGAINS

EASY PARKING

MANY REDUCTIONS

WEEKEND DEMONSTRATIONS

200 YARDS FROM JCT. 1 M5

IF YOU HAVE NOT BEEN TO OUR SHOWROOMS THEN THIS IS YOUR IDEAL OPPORTUNITY.

OVER 10,000 STOCK ITEMS ON DISPLAY – YOU WON'T BE DISAPPOINTED

MasterCard VISA Access SWITCH

100 PAGE CATALOGUE AVAILABLE ON REQUEST

WELSH DRY STEAM COAL

WASHED STEAM COAL DIRECT FROM OUR SOUTH WALES MINE

Pre-Packed in Convenient 20Kg Bags

AVAILABLE AT THE MIDLANDS MODEL ENGINEERING EXHIBITION,

OR Pre-Order to avoid disappointment

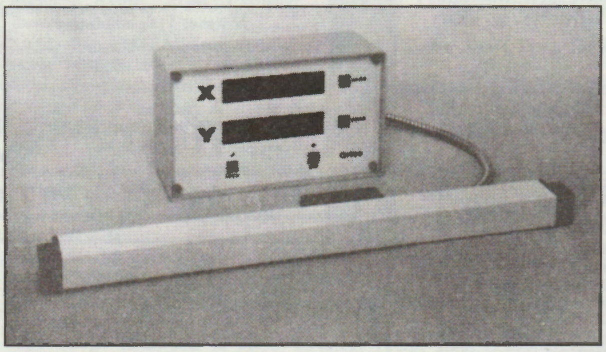
Beans (12 × 22mm nominal sizing) @ £3.50 per bag

Small Nuts (22 × 45mm nominal sizing) @ £3.85 per bag

Please contact:

DAVID SUTTON
(SIGNAL FUELS PRE-PACKED)
Tel/Fax (01204) 300444
Mobile (0802) 721537

Digital Position Read-Out



- 1 or 2 axis systems
- 0.001 inch resolution
- inch and metric convert
- optical linear encoders
- zero backlash
- rapid long moves
- easy to read display
- affordable low price

Price for a complete two axis system is:

£340 + VAT

NEW

Ortec Limited

Fosse Andre House
Le Vauquiedor
St Andrews
Guernsey
GY6 8TT
Channel Islands

Tel: 01481-35708

THE ENGINEERS EMPORIUM

15 Myfords £400-£1200 8 Boxfords £350-£800
5 Colchesters £850-£2500 plus Holbrooks, Mitchel, etc.
Theil, Deckel, Beaver, Eliot, Centec
and many more V. & H. mills, £550-£2500.

Tooling & Accessories and New Parts

LOCOS: Gauge 1-10¼" TRACTION ENGINES: ¾"-6"
Stationary Engines – 50+ completed & part built models

New list 4 × 1st Class stamps + SAE

See us at Donington, Stand 54.
Bring us your unwanted tooling, etc.

WANTED: tooling, models, workshops, etc.

Tel./Fax 01455 220340
Mobile 0831 571227

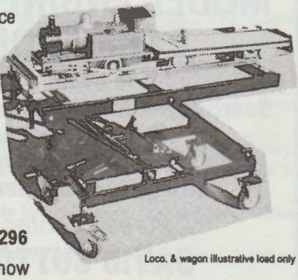
L. A. SERVICES LTD,
BRAMCOTE FIELDS FARM,
WARKS. CV11 6QL

HANDY HEIGHT LOCO TRANSPORTERS

"Shifting the Problem"

In response to many requests, we now introduce our 'Midget', a smaller and much lighter version, the idea being to be able to load your loco. from the bench to your car and then be able to load the 'Midget' and use it at journey's end.

Main features: Approx. weight 60 lbs; main frame 3'6" × 1'6" × 7"; powder coated, various colours; lockable castors; safe working load 150 kg (3cwt) certificated; in-built hydraulics; adjustable rail widths 3½", 5", 7¼". **PRICE £296**



Loco. & wagon illustrative load only

Our well established '**Standard**' and '**Midi**' are now available with 10" pneumatic wheels for travel over grass and gravel, or 5" castors for made up surfaces. **PRICES FROM £270**

For more details of our complete range, contact:
HANDY HEIGHT PRODUCTS, Langley Road Industrial Estate, Loddon, Norfolk NR14 6BN
Telephone 01508 520262; Fax 01508 520384

Reader to Reader NOTICE BOARD

***FREE* for QUERIES ● HELP ● WANTS ● SALES**

Why not contact those in the know – your fellow model engineers – through the Notice Board!

- **FOR SALE:** Wallis & Steevens road roller, 4½" scale, £3,000. Tel. (0171) 639 8369 (SE London).
- **MYFORD** ML7 3½" centre lathe, bench model, complete with all accessories, as new, price £1,150. Tel. (01202) 250182.
- **DRAPER** milling machine, model MD350. Less than one year's light use, £775 (RRP £1290 + vat). Tel. (01769) 540353 (Devon).
- **FOR SALE:** Myford ML7 lathe, fitted with quick change gearbox and on Myford stand, also including 3-jaw, 4-jaw and drill chucks, faceplate, plus some tooling. Bargain at only £700. Tel. (01268) 750131 for details.
- **FOR SALE:** Lister water cooled stationary engine No. 127628. 1½ hp, 700 rpm. Tel. (01728) 602989.
- **DRUMMOND** round bed lathe, with chucks, changewheels, hand rest, etc., good working order, £260. Tel. Colchester (01206) 561444.
- **FOR SALE:** Air receiver only, w.p. 150 psi, 30 × 12" vertical, as new, £20. Tel. (01702) 205576 (SE Essex).
- **WANTED:** Flat bed Drummond treadle lathe with chucks and tooling. Tel. (01932) 855159.
- **FOR SALE:** Engineering in Miniature, vols. 1 to 10, mint condition, in binders, £100. Tel. D J Tapsell (0118) 947 5103.
- **FOR SALE:** Castings and drawings for Easton & Anderson Grasshopper Beam Engine by Bruce Engineering, untouched, £100. Tel. (01628) 484501 (Bucks.).
- **WANTED:** Dore-Westbury Milling Machine Mark 2. Tel. (01778) 342626 (Peterbro' area).
- **SALE:** ML7 c1969, cabinet, 240V 1 Ph., standard equipment plus chucks, good for age, £600 ono. Tel. (01462) 670386 evenings.
- **MYFORD** collets, $^1/_4$" and $^3/_8$", £8 each. Wanting $^7/_{16}$". Unknown make collets, $^7/_{16}$", plain shank, $1^3/_{32}$" long, 6 off, Offers. Tel. (01449) 672777.
- **COWELL** Tailstock Rack Feed for S7, as new, £75. Tailstock lever feed for ML7, £25. Tel. (01579) 350447 (Cornwall).
- **FOR SALE:** Prestacon model engineering press, original box, complete with assembled Jeep kit, £50 ono. Tel. (01932) 864769.
- **PULTRA** 10mm headstock spindle and bearings, for 1550/1750 lathes, new, £80 ono. Collets, 6–19mm, 3-8mm and chuck arbor. Tel. (01449) 672777.
- **CENTEC** 2A horizontal/vertical 1 ph milling machine, £800. Tel. (01942) 790269.
- **TURNING** tool holders, Sumitomo, $^5/_8$" square, 1 R/H, 1 L/H. Inserts to suit $^1/_{16}$", $^1/_{64}$" radius, 20 off, £50. Tel. (01502) 514400.
- **TRACK**, 90ft, 5" gauge, $^3/_8$" square on sleepers, 6 ft lengths, £90. Tel. (01664) 60272.
- **PILLAR** drill, $^1/_2$", £120. Myford type dividing head, £150. $^1/_2$ hp band linisher, £70. Exchange distressed/unfinished clock. Tel. (01753) 854383 (Windsor).
- **MYFORD** ML7, $^1/_2$ hp motor, tools, etc., c/w vertical mill/drill attachment, $^3/_4$ hp motor, single phase electrics, £550. Tel. Peterborough (01733) 343676.
- **STUART** TURNER steam water boiler feed pump kit, boxed, new, untouched, £28. Tel. (01538) 360456.
- **'MIDLANDER'**, 7¼" gauge, battery electric, $^1/_3$ scale Ruston & Hornsby, exhibition standard, with driving trolley, £1,250. Tel. (01761) 434085.
- **HACKSAW** machine by Millers Falls, floor standing, $^1/_3$ hp, single phase, 12" blade, vice; Running centre No. 2 Morse (new); 2" dia. Dial Indicator new in box. The three for £60. Stainless tube for superheaters, $^1/_4$" dia., £1 per ft, $^5/_{16}$" dia. £1.25 per ft, $^3/_8$" dia. £1.25 per ft, post extra please. Tel. (01327) 261499.
- **MYFORD** ML7, 3- & 4-jaw chucks, fixed steady, changewheels, etc., £400. J. Toon, 2 Marston Lane Park, Rolleston on Dove, Staffs. DE13 9BJ. Tel. (01283) 813535.
- **FOR SALE:** Electric motor, 380-420V, 3 ph., 3hp, splash proof, £20. Tel. (01702) 205576 (SE Essex).
- **INFORMATION** wanted on Oxyplus welding and brazing equipment, Instruction book or Manufacturer's name (Italian). Tel. (01494) 727936.
- **HELP!** Does anyone have a design for a powerful demagnetiser? A tape head demag. won't do the job! Tel. (01482) 898434 (Hull).
- **INSTANT** cash for Retlas or any Alyn engine or 3½" gauge locomotive with outside motion. Tel. Norwich (01603) 712451.
- **CASTINGS**, loco wheels, 6 × $5^3/_8$", 6 × $3^1/_2$", £25, Allchin tender former, £5. Tel. (01579) 350447 (Cornwall).
- **SALE** forklift truck tyres, 2 off 650 × 10, 2 off 600 × 9, c/w wheels, little used. Hydraulic m/cycle workbench, heavy duty type, perfect. Nottingham (0115) 961 9806 anytime.
- **DRAWINGS**, frame and wheel castings for 3½" gauge LBSC Jeannie Deans, 3 M. Evans books, £40 ono. Tel. (01527) 540561.
- **7¼"** gauge, 3" scale, small 0-4-0 diesel outline freelance battery electric loco. House moving sale, £750. Driving truck possible extra. Tel. (01278) 732896.
- **5" GAUGE** 2-4-2 tender loco, new professional boiler four seasons ago, with current certificate, good passenger hauler, £3500. Tel. (01722) 782651.
- **5"** gauge GWR 'Castle' class locomotive, chassis and tender nearly complete, no boiler. Best offer, buyer collects. Tel. (01788) 577095.
- **FODEN** 'C' type steam lorry, 4½" scale, current boiler certificate. Tel. (01933) 355441 (Northants.).
- **FOR SALE:** Drawings and castings etc. 'Etna' LNWR Precursor 5" gauge 4-4-0, £395 ono. Tel. (01482) 631417.
- **FOR SALE:** Hobbymat MD65 lathe with many extras, all in as new condition, £485. Tel. (01622) 744322 (Kent).
- **FOR SALE:** Blacksmith's leg vice on a tripod base, £50. Tel. (0181) 204 2870 (Wembley/ Harrow area).
- **FOR SALE:** Sweeney & Blocksidge No. 2 flypress, £70 ono. Tel. (01707) 892270 anytime.
- **WANTED:** Operators manual/maintenance handbook for Taylor Hobson die sinking machine. Table size 15" × 8", reductions 1.5:1 to 7:1. All reasonable expenses refunded. Reply to P. W. Jones, c/o WWP Ltd, Unit 15 Westgate, Everite Road, Ditton, Widnes WA8 8RA.
- **CERTIFICATED** manufactured copper boiler for 5" gauge 0-6-0 3F 'Jinty' locomotive, with castings, £650 ono. Tel. (0115) 965 5207 (Notts.).
- **WANTED:** a manual or information on a 'Whitehead Junior Thicknesser', made in Halifax, England in 1948 for machining wood to required thickness. Please contact Anthony Roddick, 151a Otumoetai Rd, Brookfield, Tauranga 3001, New Zealand.
- **FOR SALE:** Alpine 12 speed drill, Model No. KTF-18. No. 2 Morse taper, no motor, £45 ono. Tel. Aylesbury (01296) 431119.
- **FLY PRESS**, Denbigh No. 3 with stand, excellent cond., £125 ono. Tel. (01270) 625516.
- **WANTED:** Magazines, 'Model Engineers Workshop', 'Home Shop Machinist', 'Projects in Metal', 'Live Steam'. Good condition essential, can collect. Offers to Bryan, tel. (01223) 843837 evenings.

Reader Service

COACHES FROM THE
BRISTOL AREA
for the
MIDLANDS MODEL ENGINEERING EXHIBITION
on
SATURDAY 18th OCTOBER
SUNDAY 19th OCTOBER
THURSDAY 23RD OCTOBER
SATURDAY 25th OCTOBER
Cost £17.50 Adults,
£16.50 OAPs, £12 Child.
To book telephone
01179 693119

YOUR ADVERTISEMENT (max. 18 words): ……………………………………………

……………………………………………

……………………………………………

……………………………………………

……………………………………………

Please include an address and/or telephone number in your entry. PLEASE PRINT CLEARLY.

Please send all entries to: TEE PUBLISHING, The Fosse, Fosse Way, Radford Semele, Leamington Spa, Warks. CV31 1XN

All entries subject to the Publisher's approval. ***✻ NO TRADE SALES ACCEPTED***

FOR OFFICE RECORDS ONLY: Name ……………………………………………

Address ……………………………………………

…………………………………………… Postcode ……………………

Daytime telephone number: ……………………………………………

SALES OPEN TO PRIVATE ADVERTISERS ONLY

DIRECTORY OF SUPPLIERS — AS CLOSE AS YOUR PHONE

BOOKS AND PUBLICATIONS — Constructional and Workshop manuals, magazines, etc.

ENGINEERING IN MINIATURE
Monthly model engineering magazine
THE FOSSE, FOSSE WAY, RADFORD
SEMELE, LEAMINGTON SPA CV31 1XN
Tel: 01926 614101 Fax: 01926 614293

TEE PUBLISHING
Model engineering books & journals
THE FOSSE, FOSSE WAY, RADFORD
SEMELE, LEAMINGTON SPA CV31 1XN
Tel: 01926 614101 Fax: 01926 614293

CAMDEN MINIATURE STEAM SERVICES
Books & Publications and Videos
Barrow Farm, Rode,
Nr Bath, Somerset BA3 6PS
Tel. 01373 830151 Fax 01373 830516

ELECTRICAL EQUIPMENT—Phase converters

POWER CAPACITORS LIMITED
Transwave Converters & Inverters
30 REDFERN ROAD, TYSELEY,
BIRMINGHAM B11 2BH
Tel: 0121-708 2811 Fax: 0121-765 4054

THIS SPACE COULD BE SELLING FOR YOU
TEL: 01926 614101

STEAM LOCOMOTIVES — 7¼" to 2'6" gauge

STEAMING FOR PLEASURE
Locomotive Design, Building, Repair
15 Park Road, Yapton,
Arundel, Sussex BN18 0JE
Tel. 01243 551899 Fax 01243 551023

SIGNAL FUELS
Suppliers of Welsh Steam Coal
Obtain your supplies at the **MIDLANDS MODEL ENGINEERING EXHIBITION,**
Castle Donington, 18-25 October 1997

TOOLS & ACCESSORIES — Workshop Equipment

THE TAP & DIE CO.
Taps / Dies / Boxed sets / Drills / Reamers – Manufactured/Supplied. All Sizes Supplied – Distributors required.
445 WEST GREEN ROAD,
LONDON N15 3PL
Tel: 0181-888 1865 Fax: 0181-888 4613

POWER CAPACITORS LIMITED
Transwave Converters & Inverters
30 REDFERN ROAD,
TYSELEY,
BIRMINGHAM B11 2BH
Tel: 0121 708 2811 Fax: 0121 765 4054

TRACY TOOLS LTD
Taps & Dies (Standard & Special)
2 MAYORS AVENUE
DARTMOUTH,
SOUTH DEVON TQ6 9NC
Tel: 01803 833134 Fax: 01803 834588

THIS SPACE COULD BE SELLING FOR YOU
TEL: 01926 614101

BOILERMAKERS — Boilers to your specifications

JOHN M ELLIS (Model Engineers)
Copper Boiler Manufacturers
UNIT 3, FAIRFIELD DRIVE off STONE LANE,
KINVER, WEST MIDLANDS DY7 6EQ
Tel: 01384 872122

SOUTHERN STEAM SERVICES
Coppersmiths & Braziers
38, KINSBOURNE WAY,
THORNHILL, SOUTHAMPTON SO19 6HB
Tel: 01703 463872 (24 hrs)

TRACTION ENGINES & STEAM ROAD VEHICLES

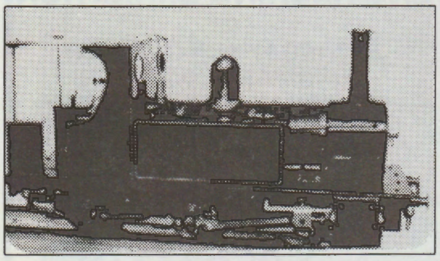
LIVE STEAM MODELS LTD
Drawings, Castings, Acc. for 3"-6" Scale Trac. Engines
OLD HALL MILLS, LITTLE EATON,
DERBYSHIRE DE21 5DN
Tel: 01332 830811 Fax: 01332 830050

DOUBLE B DESIGNS
4" scale McLaren Scale Injectors
68 CHATSWORTH DRIVE, ENFIELD,
MIDDLESEX EN1 1EZ
Tel: 0181 363 1851 Fax: 0181 304 7440

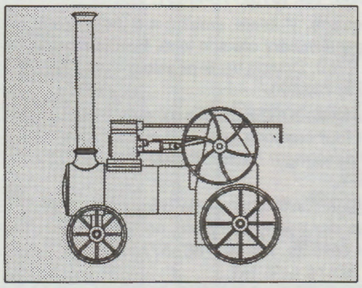
OTHER HEADINGS AVAILABLE — Please phone for details

QUALITY LIVE STEAM KITS FOR BEGINNERS

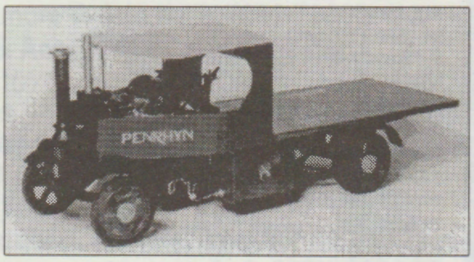
NO MACHINING REQUIRED!



POLLY
TANK & TENDER
LOCOMOTIVES
5" gauge
Stephensons Valve Gear
Copper Boiler
Cylinders 1.5" dia./2" stroke
0-4-0 and 0-6-0 versions



DRAYTON
PORTABLE STEAM ENGINE
Copper boiler Easy construction
Simple operation
Length 23", Width 10",
Height 24", Weight 23kg



PENRHYN
STEAM LORRY
1/5 scale
Copper Boiler
Two Speed Gearbox
Differential
Twin Cylinder Engine
Fully Sprung

Available as: Sets of fully machined components (Requiring only handwork to complete, designed to be easily assembled by the beginner). Ready to runs. Drawings and castings (Polly range only). Driving/Passenger Trucks and Ready-to-Use Blowers also available.

ALL COMPONENTS MAY BE PURCHASED INDIVIDUALLY IF PREFERRED.

Send S.A.E. for further information to:

See us on Stand 5 at the **MIDLANDS MODEL ENGINEERING EXHIBITION**
18-25 October 1997
Castle Donington near Derby

WINSON ENGINEERING

Dept. E.I.M., 3 & 4, Griffin Industrial Estate,
Penrhyndeudraeth, Gwynedd, LL48 6LE
Tel: 01766 771071 Fax: 01766 770028

MasterCard VISA

See REEVES MODEL ENGINEERS "The World's largest stockists of Model Engineering Supplies"

at THE MIDLANDS MODEL ENGINEERING EXHIBITION

18 - 25 October 1997

International Exhibition Centre, Castle Donington, near DERBY

Whether your interest is locomotives, traction engines, stationary engines or workshop equipment, our stand will have a full range of plans and castings, including the HRM and Don Young designs. The show is open daily from 10.30am until 6.00pm (5.00pm on last day), with a Thursday late night until 8.00pm. So make sure you visit the worlds leading supplier at the UK's leading Model Engineering Exhibition.

Order Now and collect from STANDS 13 - 15 at the exhibition

A.J.Reeves & Co (B'ham) Limited. Holly Lane. Marston Green, Birmingham. B37 7AW. England.
Telephone 0121 779 6831 Fax 0121 779 5205 e-mail ajreeves@dial.pipex.com

---

TRACY TOOLS LTD.

2 Mayor's Avenue, Dartmouth, S. Devon TQ6 9NF.
Telephone: (01803) 833134 • Fax: (01803) 834588

10PC. HEAVY DUTY DRILL
SET. No. 1 M/TAPER – VARIOUS SIZES
UP TO 1/2" @ £10 SET

SET No.						
1.	**MODEL ENG TAPS & DIES SET** (2 Taps & Die each size) 1/8" x 40, 5/32" x 40, 3/16" x 40, 7/32" x 40, 1/4" x 40, 9/32" x 32, 5/16" x 32, 3/8" x 32	(TAPPING DRILL SET £5)				**TAPS £15** **DIES £15**
2.	**"SPECIAL" MODEL ENG TAPS & DIES SET** (2 Taps each size) 1/4" x 32, 9/32" x 40, 5/16" x 40, 3/8" x 40, 7/16" x 32, 7/16" x 40, 1/2" x 32, 1/2" x 40	(TAPPING DRILL SET £8)				**TAPS £18** **DIES £18**
3.	**BA TAP SET** (2 Taps each size), and BA Die Set 0-1-2-3-4-5-6-7-8-9-10-11-12-14BA	(TAPPING DRILL SET £5)				**TAPS £15** **DIES £22**
4.	**26 TPI TAP SET** (2 Taps each size), 26 TPI DIE SET (BSB or CEI) 3/16" x 26, 1/4" x 26, 5/16" x 26, 3/8" x 26, 7/16" x 26, 1/2" x 26	(TAPPING DRILL SET £5)				**TAPS £15** **DIES £15**
5.	**BSF TAP SET** (2 Taps each size), & BSF DIE Set. 3/16", 7/32", 1/4", 9/32", 5/16", 3/8", 7/16", 1/2" BSF	(TAPPING DRILL SET £5)				**TAPS £15** **DIES £18**
6.	**BSW TAP SET** (2 Taps each size), & BSW Die Set. 1/16", 3/32", 1/8", 5/32", 3/16", 7/32", 1/4", 9/32", 5/16", 3/8", 7/16", 1/2" BSW	(TAPPING DRILL SET £5)				**TAPS £15** **DIES £18**
7.	**METRIC Coarse TAP SET** (2 Taps each size), & METRIC Die Set 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 12.0mm	(TAPPING DRILL SET £8)				**TAPS £18** **DIES £20**
8.	**UNF (OR UNC) SET** 1/8, 3/16, 1/4, 5/16, 3/8, 7/16, 1/2, (TAPPING DRILL SET £5)					**TAPS £15/DIES £15**
9.	**METRIC FINE TAPS** 15 taps from 3.0 to 20.0mm					**TAPS £15/DIES £30**
10.	**REAMER SET** 1/16 - 1/8 - 3/16 - 1/4 - 5/16 - 3/8 - 7/16 - 1/2					**£30 Set**
12.	**COLLET CHUCK** complete (to take threaded endmills up to 3/4 dia.)	(ALL SHANKS)				**SET £70**
13.	**MORSE TAPER SOCKET REAMERS (HS)**	No. 0 MT @ **£15**	No. 1 MT @ **£15**	No. 2 MT @ **£18**		No. 3 MT @ **£20**
14.	**Extra Long HS DRILLS** (Heavy Duty), 10 sizes, from 1/16" to 5/16"					**SET £6**
15.	**FILE SET** (6 pieces, 4" & 6" & 8" Assorted)					**@ £5 SET**
16.	**REVOLVING Lathe Centres with Thrust Bearings**	No. 1 MT **£15**	No. 2 MT **£18**			No. 3 MT **£18**
17.	**SLITTING SAWS** (Set of 3, up to 1/16" wide, 2" or 3" diameter)					**SET £5**
18.	**DRILL SET, CHROME STEEL (USA)** 1/16 - 1/2, x 64ths, with steel stand					**SET £10**
19.	**DRILL CHUCKS (Rohm Precision)**	1/4 @ **£6**	5/16 @ **£7**	3/8 @ **£8**	1/2 @ **£10**	(with free Arbor)
20.	**ENDMILL SET (HS)** 1/8 - 3/16 - 1/4 - 5/16 - 3/8 - 7/16 - 1/2 screwed shank	(ALSO SLOT DRILLS)				**SET £20**
21.	**DRILL SET** 1 - 60, 1/16 - 1/2, 1 - 13mm, A - Z					**ALL SETS £18 EA**
22.	**GAS PIPE SET**: 1 Tap each: 1/8 - 1/4 - 3/8 - 1/2 - 5/8 - 3/4 BSP					**TAP SET £10/DIE SET £20** (All Sizes)
23.	**EXTRA LONG DRILLS** up to 1/2, No. 1 MT (6 pieces)					**@ £15 SET**
24.	**HS DRILL SET** (1/2" shank), 9/16 - 5/8 - 3/4 - 7/8 - 1"					**£18 SET**
25.	**BOXED SET 0-10BA TAPS & DIES with HOLDERS**	**£35**				(High Speed Steel **£80** Set)
26.	**D-BIT SET** (9 Sizes) 1/16 - 3/32 - 1/8 - 5/32 - 3/16 - 7/32 - 1/4 - 5/16 - 3/8, 7/16 - 1/2 (Ground Finish)					**SET £25**
27.	**GEAR CUTTERS (H.S.S.)** All sizes from 0.2 to 10.0 MOD (2 to 120 DP), 1" bore only, involute type					**@ £18 each**

PLEASE ADD 20% TO COVER VAT, 1st CLASS PACKAGE & POST

ALSO: Selection of Dovetail, Woodruffe, Ballnose, Concave, Spotfacers, Broaches, Knurls, Carbide Centres, Cycle Taps & Dies, Boring Bars, Left Hand Taps & Dies, Milling Cutters, Reamers, Countersinks, Gear Cutters, Slitting Saws, Acme Taps, Diehead Chasers, Socket Reamers.
These are available at between 50% & 75% off list price.
(MONDAY TO FRIDAY) OPEN 8.00a.m. to 4.00p.m. (Sat. noon) CLOSED WED.
Despatch by return. Overseas P&P (Air £12.00 Min.)
SEND FOR NEW COMPLETE CATALOGUE (STAMP PLEASE)

SPECIAL THREAD TAPS & DIES

BRITISH WARRIOR BRAND

Old Oak Auctions

ARE PROUD TO ANNOUNCE THEIR FORTHCOMING AUCTION OF STEAM MODELS AND ENGINES, COLLECTABLE TRAINS, MODEL RAILWAY MATERIAL AND ASSOCIATED RELICS AND EPHEMERA

Sale to be held at the famous Saracens Head Hotel, Towcester, Northants on

18TH OCTOBER AT 11AM VIEWING FROM 9AM

VIEWING PRIOR TO THE DAY OF THE SALE BY ARRANGEMENT WITH THE AUCTIONEERS

Items for sale include the lifetime's model engineering work of Mr. Harry Varney formerly of the Slough and District Society of Model Engineers. All items are built to top quality engineering standard and finish including $2^1/_2$in. gauge 'Annie Boddie', $3^1/_2$in. gauge 'Maisie', steam tug 'Cervia', beautifully made radio controlled Marblehead yacht, length 130cm (51in), $1^1/_2$in. scale 'Allchin' traction engine, together with stationary engines including 2 very early unusual engineer built models: $7^1/_4$in. J94 tank locomotive, $7^1/_4$in. 0-4-0 pannier tank locomotive, superb 5in. gauge 'City of Truro', $3^1/_2$in. gauge 'Dyak' and 'Molly' together with other locomotives and models, spare parts and accessories.

The sale will also include an important collection of '0' gauge model railway material, a fine collection of shipping books together with railway books, ephemera and relics and many other items.

Superb colour and fully illustrated catalogue complete with historical reference details available now from:

Old Oak Auctions, The Old Bakery, 24 Brackley Road, Towcester, Northants NN12 6DJ. Tel: 01327 358080 Fax: 01327 358388

Catalogues are £6.00 each and admit two to the auction.

Please make cheques payable to 'Showclear Ltd'.

Technical consultant; Jeffery Knight

Is the big stuff getting too big, too heavy?
Fancy running your engines whenever the mood takes you – in your own back garden? Fancy building something big enough to challenge your engineering skills yet small enough to be done on the smallest workshop equipment?

What you should be doing is building in 16mm (1/19th) scale.

The Association of 16mm Narrow Gauge Modellers

The biggest model railway scale, where the model engineering challenge can be enjoyed to the full.

See 16mm in action at the Midlands Model Engineering Exhibition, Castle Donington, 18-25 October 1997.

Write to the Membership Secretary, E. J. Hodson, Brooklands, Stafford Road, Penkridge, Stafford ST19 5AX.

MODEL ENGINEERING SUPPLIES
(BEXHILL)

De la Warr Mews, Station Road, Bexhill on Sea, East Sussex TN40 1RD

Tel: 01424 223702. Fax: 01424 223702

All model engineering requirements stocked.

Steel, brass, copper, p/bronze.

A good range of used equipment carried, including machines and tooling.

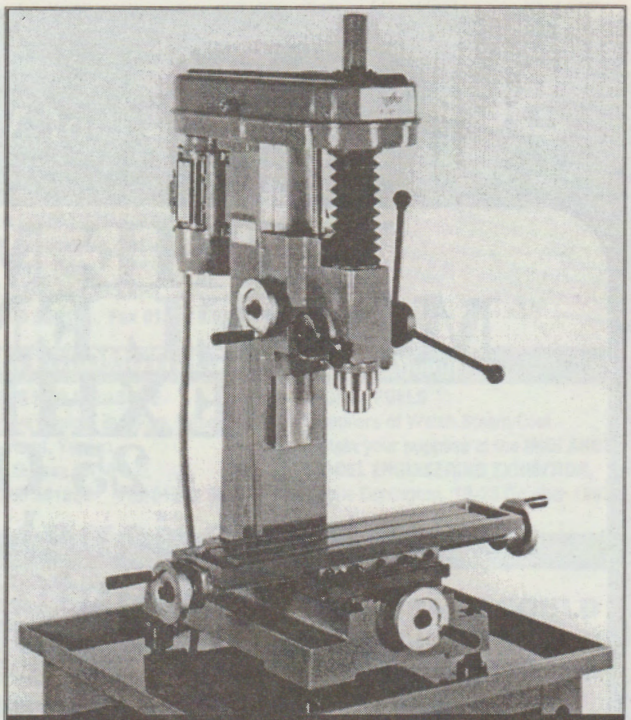
In stock at present battery electric locos, Class 33 'Baby Deltic' 5" gauge, Class 08 in 5" gauge.

Driving trucks 'Queen Mary' brake vans in 5" gauge.

MAIL ORDER CATALOGUE £1 INC POSTAGE

ALL MAJOR CREDIT CARDS

Part exchanges **Workshops bought**



The VM-B from Myford Direct

Now with more model choice

The standard VM-B with 9 spindle speeds from only £1,330.00

incl V.A.T.

or

The NEW Vari-Speed VM-B

from only £1,775.00

incl V.A.T.

Please send me details of the VMB VariSpeed (EIM)

Name:..

Address:..

...

Post Code:................ Telephone:.................................

Myford Ltd., Wilmot Lane, Chilwell Road, Beeston, Nottingham NG9 1ER

Books for the enthusiast

Make your choice from the largest and finest selection available

TELLS YOU HOW!

BUILD YOUR OWN STEAM LOCOMOTIVE by Jack Buckler

Covering the construction of that most popular of locomotives, 'Sweet Pea', a 5" narrow gauge Bagnall style locomotive. First published as a series in 'Engineering in Miniature', and now available completely revised and updated in book form. It's the book for the miniature steam locomotive enthusiast who wants to build and own his own locomotive.

Our price £11.95 plus just 99p postage, TOTAL ONLY £12.94

A UNIQUE BOOK!

PORTABLE STEAM ENGINES

by W. D. Wansbrough

A reprint of an early book published in the heyday of the portable containing considerable information for the enthusiast and modeller. Well illustrated throughout.

Our price just £12.95 plus 99p postage, TOTAL ONLY £13.94

PACKED WITH KNOWLEDGE

THE LIVE STEAM BOOK by LBSC

A collection of illustrated 'notes' from his 'words and music', fully describing tried and tested components and accessories for small steam locomotives. Published in the 1920s as 'Shop, Shed and Road', this book is a reprint of the renamed and much expanded 1950 edition.

£12.95 plus £1.70 postage, TOTAL ONLY £14.65

WHY PAY MORE?

LOCOMOTIVE VALVES & VALVE GEARS by J. Yoder & G. Wharen

One of the leading books on the subject written by authors who were practising locomotive engineers with the Pennsylvania Railroad. Gives extensive descriptions of most valve gears and their setting and is profusely illustrated. Paperbook edition, over 280 pages.

Our price just £10.95 plus £1.70 postage, TOTAL ONLY £12.65

OUR *FREE* BOOKLIST – For the largest selection of Model Engineering books you must have our ***NEW*** catalogue. It contains nearly 500 books and what's more, it's FREE. If you don't already have a copy either send an SAE or phone **01926 614101** for your copy NOW!

DRIVER'S MANUAL

STEAM WAGON MANUAL

First published in 1918, this useful book gives an insight into the commercial operation of any make of steam wagon. As well as showing the reader how to get the best out of all types of steam road vehicles it will also prove invaluable to the model builder.

Our price just £6.95 plus 75p postage, TOTAL ONLY £7.70

GEARS FOR SMALL MECHANISMS by W O Davis

Covers the theory and practice of the design of very small gears, friction and efficiency of tooth action, design of tools for cutting and generating gear tooth forms and production and testing of gears used in clocks and other machinery. Required reading for some study courses.

Just £15.95 plus £1.40 postage, TOTAL £17.35

THE book on gears!

A BEGINNER'S GUIDE TO MODEL STEAM LOCOMOTIVES by Tim Coles

Steam engines command a fascination all their own. The author shows how you can build your own miniature steam locomotive. Gives full instructions, plus clear diagrams, to enable anyone to construct their own loco in a home workshop. Includes how and where you can run your engine. **Just £11.95 plus £1.70 postage, TOTAL ONLY £13.65**

A PRACTICAL TREATISE ON HOT AIR ENGINES

by Edgar T Westbury

With historical notes and diagrams, plus plans and construction details of several model hot air engines, this book is a must for the hot air enthusiast. **Just £7.95 plus 75p postage, TOTAL £8.70**

No. 1 BEST SELLER

MODEL ENGINEERS WORKSHOP MANUAL

by George Thomas, edited by W. A. Bennett

The third book by this highly respected author which has become the 'bible' both for the novice and experienced alike. Containing over 300 pages packed with guidance on most aspects of machining. Its twenty eight chapters cover a vast range of machining processes and the construction of a varied range of accessories for the lathe.

Our price £19.95 plus just £1.70 postage, TOTAL ONLY £21.65

PURE NOSTALGIA those were the days!

MECCANO No. 10 Manual, showing the vast range of working models that could be built. **£9.95 (C)**

A Wonder Book of Toys A reprint of the 1939/40 Meccano catalogue. 72 pages of pure memories! **£4.95 (B)**

MAKE YOUR OWN!

LOCOMOTIVE INJECTORS

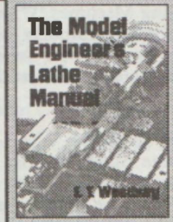
by J W Harding & 'The Inspector'

A combination of two books, written by the acknowledged leaders on the subject in their day. The combined knowledge contained in this book will enable any model engineer to understand the working of the injector and to construct his own injectors.

Just £7.95 plus 99p postage, TOTAL £8.94

STOP PRESS – The Story of the Steam Plough Works 1850-1947. OUR PRICE £25.00 plus £2.95 postage. Others charge £32.20!!

OUR UK POSTAGE & PACKING is always shown separately. Inclusive prices are perhaps easier but are they fairer? Why not compare our postage costs, for example *Model Engineers' Workshop Manual* by George Thomas – elsewhere you could pay as much as £23.15. Our price of £19.95 plus £1.70 postage equals £21.65, YOU SAVE £1.50!
***REMEMBER* – book orders over £50.00 are POST FREE.**
OVERSEAS POSTAGE – *Please enquire.*



THE MODEL ENGINEER'S LATHE MANUAL

by E T Westbury

The late Edgar Westbury was probably the most authoritative writer in the history of model engineering. His first major book was the *ME Lathe Manual* published in 1951, subsequently revised and titled *Metal Turning Lathes*. In reprinting the work we have reverted to the original title, reflecting the descriptions of the size and type of machinery used today. **£10.95 plus 99p p&p, TOTAL £11.94**

THE QUORN UNIVERSAL TOOL & CUTTER GRINDER

by Prof. D H Chaddock. Full information on construction and detailed instructions on its use. Of equal value to amateur engineers and those who work in toolrooms, model shops and specialist engineering services, etc. **£10.95 plus £1.40 postage**

SATISFACTION GUARANTEED WITH OUR BOOKS! We describe all books carefully so you know just what you are buying. If however you are dissatisfied please contact us whereupon we will try to help. We don't offer a full satisfaction or exchange guarantee (you don't want to receive someone else's rejects that has been thumbed or through the post three times) but we will always try to help!
REMEMBER – Absolutely NO ONE carries the range of books that we do – far more than any other bookseller.

ORDER BEFORE NOON ON OUR 24 HOUR CREDIT CARD HOTLINE – 01926 614101 – FOR SAME DAY DESPATCH or write to:

TEE Publishing

The Fosse, Fosse Way, Radford Semele,
Leamington Spa, Warwickshire CV31 1XN
Tel: 01926 614101 Fax: 01926 614293

Wake Up From Your Worst Nightmare!

Half Price INTRO OFFER!

Why do you think Q-Cut is the most widely used parting tool in industry? . . .

"Q-Cut" was launched in 1987 by Sandvik Coromant, and has quickly proven itself as industry's favourite parting system. Now, Greenwood Tools reintroduce the system in a format that can be used by model engineers. Our version will fit straight into the vast majority of ME lathes in use today, including Myford ML7 and ML10 machines, regardless of toolpost type.

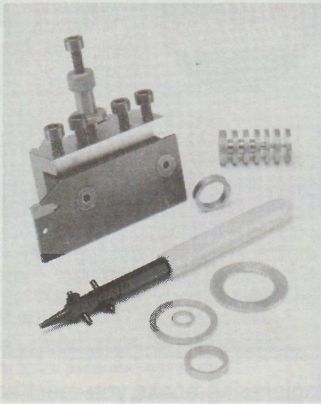
The tool is made of a high quality spring steel, and clamps the insert into a double-V shaped pocket, using a finger which deforms within the elastic limits of the blade material. Maximum reach is 20mm, giving more than 1½" diameter parting capacity in solid bar.

The insert is made in Sandvik's 'all-round' grade of carbide, GC1025. This will part off practically any material, including steels, stainless steels, cast iron, non-ferrous metals (such as aluminium, copper, brass and bronze), plastics and wood. The unique dimple on the top face of the insert actually reduces the thickness of the swarf, and effectively prevents it from trapping in the groove as the operation proceeds. The cutting-edge geometry generates low cutting forces, and hence reduces vibration.

Locating the insert in the tool is a quick and easy operation. The precision cutting insert is pushed into the jaws of the pocket by hand, and then levered back firmly against its stop using the key supplied. The same key is used to eject the worn insert when it eventually needs replacing.

The tool can be used on the front or back toolpost, and comes to you ready to use, complete with cutting insert and key.

So, Wake Up to trouble-free parting. Wake Up to a perfect edge every time. Wake Up to long, long tool life. And finally put your parting-off nightmares to bed.



For illustrative purposes, our picture shows Q-Cut held in a Myford quick-change toolholder. This is not included in the price.

Order Part No. "KIT-Q-CUT 250" at £29.90 inc V.A.T. (P&P £1 extra)
1/2 PRICE INTRODUCTORY OFFER APPLIES TO FIRST 400 KITS ONLY.

Tel 01527 877576 **Fax 01527 579365**

Access

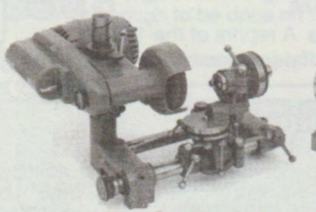
GREENWOOD TOOLS

VISA

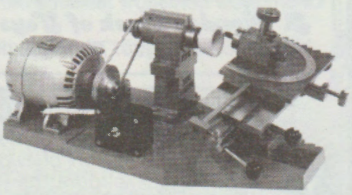
Sherwood House, Sherwood Road, Bromsgrove, Worcs. B60 3DR

KITS FOR TWO TOOL AND CUTTER GRINDERS

The Sophisticated *The Simple*



The Quorn



The Kennet

For information on these and other kits, s.a.e. to:

MODEL ENGINEERING SERVICES
Pipworth Farm, Pipworth Lane, Eckington, Sheffield
Phone 01246 433218 S31 9EY

COPPER BOILER MAKERS

For boilers built to a standard demanded by professionals you need to speak to professionals.

Railmotor Boiler

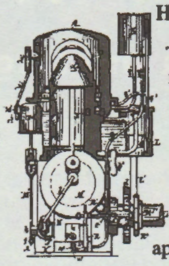
Contact: John Woodroofe for a quotation on any boiler.

Our boilers are made only with highest quality materials to standard designs or customers' requirements, boiler flanged plate kits are also available.
All boilers are tested, certificated and of guaranteed quality.

- Locomotive
- Traction Engine
- Stationary
- Vertical
- Horizontal
- Steam Lorry
- Narrow gauge
- Marine
- Custom design

CHEDDAR MODELS
Sharpham Road, Cheddar, Somerset BS27 3DR
Access Tel. 0934 744634 Fax 0934 744733 Visa
OVERSEAS ORDERS ARE WELCOME

GREAT NEW BOOKS for Autumn Reading!

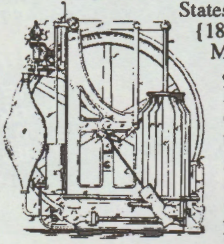


Hot Air Engines - U.S. Patents 1871 -1959 **£ 8.40**
Today's hot air engine is a intriguing mix of old ideas and modern technology, a fact well seen from this fascinating collection of 17 complete patents on the subject issued between 1871 and 1959 by the US Patent Office. What is really interesting about this collection is not the well known names, such as Rider, Ericksson & Philips, but the host of patents issued to patentees whose designs we cannot recall ever seeing the light of day. Try building some of them! 93 page paperback, with original patent application drawings.

Air Board Technical Notes **£ 9.90**
Historically important book, originally published pre 1918 (it features a Royal Flying Corps logo), these Notes were intended to help maintenance staff in the field to keep early aircraft engines running. They start with 16 pages of General Notes which reflect the fact they concern what was then very new technology. The Notes then turn to specific engines: The 90H.P. R.A.F. 1a (19 pages), the 120 H.P. Beardmore (19 pages), the 80 H.P. Gnome (17 pages), the 100 H.P. Monosoupape (15 pages), the 80 H.P. Le Rhone (16 pages) and the 110 H.P. Clerget (18 pages).Each section has drawings, photos and diagrams of the engine concerned, together with text which covers the engine's technical specifications, construction and operation. You get VEE types, in line and rotary engines in this selection.If you are thinking of buildinga model of one of these engines, the book will be invaluable in getting it "right", but there is just so much information here that anyone interested in early IC engines, and aero engines in particular, will find this book a real delight. Paperback.

A Steam Plant for Model Aeroplanes [Groves] {1913} **£ 5.65**
Taken from pre WW I issues of *Model Engineer*, this book describes in some detail a steam engine and flash steam boiler which, it says, reliably powered model aircraft. Whilst shown, the aircraft themselves are not described. An interesting project, but for pity's sake don't fly the result anywhere near anything inflammable (or us)! Includes other articles on building small boilers and feed pumps. 34 page heavily illustrated large format pamphlet.

IC Engines Vol.1 Patents 1881 to 1890 **£ 8.40**
A unique collection of fourteen early IC engine patents from the United States Patent Office. Featured are patents to: Ravel {1881}, Rider {1881}, Hopkins {1883, '84 & '85}, Maxim {3 patents - all 1884}, Atkinson {1884, '86 & '87}, Hibbard {1890}, Sharpneek {1890} and Brayton {1890}. Some, notably Atkinson's, led to commercially succesful engines but others, such as the monster Hibbard rotary gase engine didn't. You get the complete patents with full text and drawings. If you are interested in the development of IC engines, this is a fascinating window into their infant years. 95 page, larger format paperback.



Injectors: their theory, construction & working {1893} [Pullen] **£12.25**
The best book we have seen on injectors, even if it is over a hundred years old! It may not include very modern injectors, but the science of injectors was well developed when it was published, and it does cover all injectors and ejectors of the period in considerable detail. More importantly for those wanting to build their own injector or ejector, it includes many formulae to help in designing one which will really work. The original copy from which we made this reprint clearly had some appreciative owners and, where pertinent, we have included their comments, extra pages etc. Great book for the technically minded! 210 pages. 109 drawings/illustrations. 10 tables. Paperback.

Milling Machine Practice {1940} **£ 3.75**
From the Cincinnati Milling Machine Co, this very useful booklet contains four chapters; Analysis of the Process of Milling, Milling Cutters, Use of Milling Cutters, and Milling Machines. Within these chapters, and especially the first three, is an extraordinary amount of useable information. Admittedly it was aimed at Industry (probably for building Sherman tanks), but much of it is of use to the model engineer. And at this price....... 28 page, heavily illustrated softcover.

The Heavy Gang [Neville] **£ 8.15**
Written by the late Steve Neville, this reprint is a "Memorial Edition" to him.Tells the story of boilermakers J.Hickey and Sons of Richmond, Surrey and in particular the three Burrell Road Locomotives they owned, which were used to deliver their products, and also hired out to others as available. All three engines survive to this day, and we reckon this is the **best** book on steam heavy haulage to appear. 41 full page photos. 82 landscape format pages. Paperback.

Prices shown INCLUDE Post & Packing within the U-K
(overseas customers allow 10% extra for surface mail - we refund any excess)

MAIL ORDER (no stamp required in the U-K) to:
CAMDEN MINIATURE STEAM SERVICES
FREEPOST (BA1502), Rode,
Bath, BA3 6UB
Tel: 01373-830151 Fax: 01373 - 830516

VISA MasterCard

HOME AND WORKSHOP MACHINERY

QUALITY USED MACHINE TOOLS

144 Maidstone Road, Footscray, Sidcup, Kent, DA14 5HS.

Telephone 0181-300 9070 - Evenings 01959 532199 - Facsimile 0181-309 6311.

Open all week and Saturday morning.

10 minutes from M25 - Junction 3 and South Circular – A205

MISCELLANEOUS / FABRICATION MCH.

EMCO dividing head c/w circular 6" table, direct/indirect dividing	£275
BRIERLEY drill point grinder c/w; chuck and formers	£345
SWAGE BLOCK + stand	£145
BURNERD Collet Chuck + 6 collets, suit Bantam	£245
MEDDINGS Fretsaw, 24" throat	Choice from £350
RAPID Chipper Hopper	£325
KASNET Mini Furnace	each £175
DOMINION Wellsaw, 4" capacity, 240 volts	£325
BOXFORD Little Giant Tool Post Grinder, boxed	£300
GRYPHON 8" Bench Grinder, 3 phase, as new	£165
BOXFORD 4½" Vertical Slide (T slot table)	£375
DENBIGH NO.5 Flypress + stand	£425
BUTLER Shaper 24" shaper + vice	£1,425
SURFACE TABLES 3' x 2', 4' x 3', 8' x 4'	from £200
AJAX 6" Hacksaw, as new condition	£475
INGERSOLL RAND/SHERRY & SON Compressors	Choice £345
BURNERD GRIPTRU 6 jaw Chuck (suit Bantam etc)	£245
EXCEL Filer, bench model, 240 volts	Choice £175
GABRO Box and Pan/General Purpose Folder, 2ft	As New £525
PVE Sine Square	As New £120
TOM SENIOR Slotting Head	£425
ELLIOT '00' / Junior Slotting Head	£425
EDWARDS FOLDER /2ft, 169, Pedestal, model	£225
KENNEDY NO 60 hacksaw, bench model	Choice £225
RAGLAN tailstock, almost as new	£245
COLCHESTER Student/Master round head faceplates large/small	£50/£80
ROTARY TABLE 6" horizontal/vertical	New £170
LINMATIC Filer, pedestal model	£250
QUALTERS AND SMITH 6" Hacksaw	£345
VEHICLE MOUNTED CRANES	From £275
FORGE DS130 Ceramic Chip Type	£425
BORING HEADS 2/3 morse, R8 taper max cap 4½"	New, Each £90
EPCO 5cwt mobile crane	£220
DIVIDING TAILSTOCKS, various	Each £50
CLARKSON Radius Attachment, boxed	£425
BANDSAW, 4½" horizontal/vertical	New £170
BLACKSMITH'S Leg Vice including stand	£75
EDWARDS Guillotine 1m/16g fabricated	£950
ANVIL, 1cwt on stand	£125
ODONI Machine Bed Clamps (pair)	Special £24.50
HEIGHT GAUGES by Chesterman, Shardlow, Moore and Wright	From £95
BOXFORD 8" Shaper, complete with vice	£475
ABWOOD 6" Universal Machine vice	£345
EDWARDS 1.5 metre Guillotine 16BG	£950
ALBA 10" Stroke Shaper	£300
ELLIOTT 10M Shaper, 10" stroke	£325
ELLIOTT 5" Universal Dividing Head	£345
SMART AND BROWN H3/H5 Toggle Press	£145/£165
DIE Boxes	From £45
TRANSWAVE 3HP Converter	New £265
TRANSWAVE 5HP Converter	New £335
CROMPTON PARKINSON ¾ HP, resilient mount, Boxford/Myford Super 7 Type motor	New £125
DEWHURST TYPE A Reversing switch	New £49
TAYLOR HOBSON Model D complete with script	£750
RISHTON MILLING MACHINE attachment (for Lathe)	As New £750
COLCHESTER STUDENT capstan Attachment	As New £575

GRINDING/BUFFING

ABWOOD Plough Grinder and Magnetic Chuck	£645
CLARKSON MKI Tool and Cutter Grinder	£550
CAPCO/SUPERIOR Surface Grinders	Each £450
CLARKSON MkII complete on cabinet stand	£1,475
EAGLE MODEL 2 Surface Grinder, table; 21" x 6"	£450
EAGLE Surface Grinder Model 3W + Eclipse Magnetic Chuck 14" x 6"	£825
IGAR VICTORIA Surface Grinder + Magnetic Chuck 18" x 6" / Fine Pole, Coolant	£1,475
JONES AND SHIPMAN 310 Tool and Cutter Grinder + Universal Head	£1,475
MILFORD 12" Pedestal Grinder	£325
PINNACLE MODEL 450A Tool and cutter Grinder (current Model) capacity, 8½" x 16" 1986	£1,275
UNION Ttool and Cutter Grinder, universal head, centres etc	£950
VICEROY grinder, pedestal model	£145
VICEROY buffers, pedestal models	Each £145

DRILLS

FOBCO ½" Bench/Tilting Table	£325
HERBERT Pedestal Precision Drill Model 15HA 1/16" chuck/12,000 revs	£400
POLLARD CORONA Pedestal ½"/1 Morse	from £125
STARTRITE Bench/Pedestal Models, ½" capacity	£200/£250

MILLING MACHINES

V - Vertical, H - Horizontal

ADCOCK AND SHIPLEY 1ES, H, 30" x 8" travel 13" x 8", excellent	just £950
ARNO, H-V + Slotting Head	£1,650
ASTRA L4 V/H, quill feed Vertical Head, 1" arbor, cabinet stand	£1,625
BRIDGEPORT turret mch, belt head/R8, geared table, 42" x 9", collets, clean machine	£1,725
BRIDGEPORT Turret Mch. variable speed, powered head/R8, 48" x 9" table, coolant, 1976	£3,250
BRIDGEPORT SERIES 1 / 2HP, 42" x 9" table, variable speed head and table, coolant	POA
CENTEC 2A horizontal, swivel 16" x 4¼" table, arbor 1"	£580
CENTEC 2B V-H, quill feed/2 Morse Taper head, almost immaculate, table; 25" x 5"	£1,750
COLCHESTER TRIUMPH 7½" x 40", fully geared, metric/imperial screwcutting gearbox	Just £1,750
ELLIOT JUNIOR, vertical turret, 3 Morse head & horizontal	£1,200
ELLIOT 181 V, H, table; 28" x 7½" (powered), excellent condition	£1,450
EMCO MENTOR, V, 2 Morse Taper/Swivel Head	only £950
HARTFORD TURRET MILL, Quill feed, powered R8 head, table; 42" X 9" 1979	£1,400
KEARNEY AND TRECKER Turret Mill, 40INT, 52" x 12", table, quill head, DRO	£1,750
MYFORD VMC turret mch, belt, change head/R8, table; 24" x 6", speeds 160-2540 rpm	£1,625
RAGLAN, v. head; 2 morse taper, variable speed, collet chuck	£1,200
RICHMOND NO.1 H–V powered 30" x 8" table	Excellent Value £495
RISHTON VM60 Bench Machine, table 24" x 6", geared 6 speed head Clarkson chuck and vice	£2,450
TOM SENIOR MODEL E, quill feed/2 Morse Taper, table 25" x 4¾", 240 volts	£1,850
TOM SENIOR horizontal table; 25" x 6" arbor 1" bore	£575
TOM SENIOR M1, h/v, table 25" x 6"/powered, head; 2 Morse taper/arbor 1" bore, exceptional condition	£1,400

LATHES

BOXFORD TUD, 4½" x 20", 3 jaw chuck, cabinet stand, hand feeds	Only £295
BOXFORD 4½" x 20", model CUD, change wheels, 3 jaw chuck, cabinet stand	£725
BOXFORD AUD 4½" x 22", gearbox, power cross feed, 3 jaw chuck, cabinet stand and coolant	£950
BOXFORD CUD 5" x 22", changewheels, 3 jaw chuck, cabinet stand	£950
BOXFORD AUD 5" x 24", (imperial) gearbox, power cross feed, Dickson, Tools	£1,400
BOXFORD 1130, 5½" x 30", geared head, gearbox, 3 jaw chuck, collets	£1,950
COLCHESTER BANTAM 1600 model, 5" x 20", geared head, power feeds, gearbox	£1,400
COLCHESTER CHIPMASTER 5" x 20", 3 jaw chuck, Colchester quick change tooling, good working order	£950
COLCHESTER STUDENT 6" x 24", geared head, gap bed, power cross feed, 4 way tool post	£950
COLCHESTER STUDENT 6" x 24", square (1200) head, well equiped	£2,550
COLCHESTER STUDENT 6" x 25", 1800 models, fully geared	£3,550
COLCHESTER TRIUMPH 7½" x 48" fully geared/well equipped	£2,450
HARRISON L5, 4½" x 24", fully tooled, complete with clutch	£950
HARRISON 140 5½" x 24", geared head, power feeds, gap bed, 3 jaw chuck, steady	£1,250
HARRISON M300 6" x 24" geared head, gearbox, 3/4 jaw chucks	£2,450
MYFORD ML7 3½" x 19", changewheels, 3 jaw chuck, we have a large selection of this popular model	From £725
MYFORD ML7B 3½" x 19", gearbox, 3 jaw chuck etc	£1,250
MYFORD ML7TB 3½" x 19", Tri-lever, gearbox, 3 jaw chuck, 4 way tool post, cabinet stand	£1,200
MYFORD ML7 3½" x 31", changewheels, 3 jaw chuck	£1,125
MYFORD SUPER 7 3½" x 19", changewheels, 3 jaw chuck	Choice £950-£1,150
MYFORD SUPER 7B 3½" x 19", gearbox, 3 jaw chuck	Choice £850-£1,400
MYFORD SUPER 7 3½" x 31", changewheels, 3 jaw chuck	Choice £1,400
MYFORD SUPER 7, 3½" x 19", 3 jaw chuck, power cross-feed, late model	Choice
MYFORD SUPER 7B, 3½" x 19", gearbox, 3 jaw chuck, cabinet stand, power cross-feed, late machine	£2,950
MYFORD SUPER 7B 7½" x 31"	£2,950
PULTRA 1770 70mm x 170mm, 3/4 jaw chucks, collets, vertical slide, V/S inverter, stand	£1,475
SOUTHBEND 8" x 52", gearbox, power feeds, 3/4 jaw chucks	£950
SMART AND BROWN collet lathe, complete with collets	£325

TOO MANY LATHES TO LIST!!

JIG BORERS

BCA MKIII Jig Boring Machine, 8" diameter table, 10 spindle speeds 300-3,250rpm	Reduced to Clear £950
ELLIOT Mini Borer, collets, powered quill feed head, table 6" x 7"	£1,400

All prices exclusive of VAT.

VISA

PRECISION TOOLS/MACHINE SPARES

Access

WE HAVE A LARGE SELECTION OF MACHINE TOOLS AND MEASURING EQUIPMENT FAR TOO MUCH TO LIST.
PLEASE RING US WITH YOUR REQUIREMENTS. WE WILL BE PLEASED TO HEAR FROM YOU.
DISTANCE NO PROBLEM!!

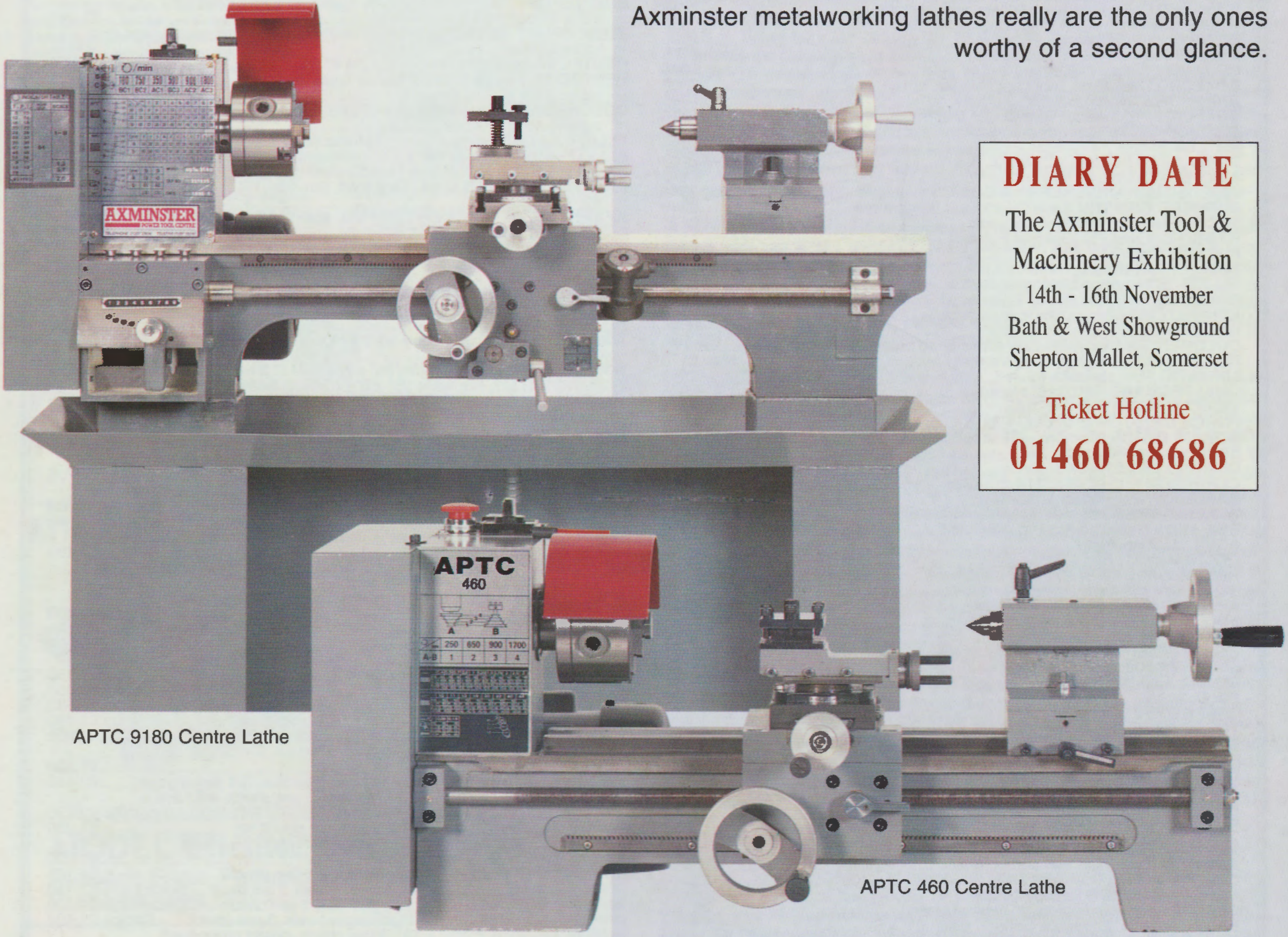
DELTA

SWITCH

APTC Metal Turning Lathes

... it's worth turning your attention to Axminster

There are many variations of these two lathes on the market but be warned they are not all what they seem. However, with Axminster you can be assured of premium quality machines, fully updated to our own specification which conform to all current CE safety regulations and offer outstanding value for money. The APTC 460 is an exceptional little lathe with a cast iron bed which will find a welcome home in any workshop whilst the excellent capacity and versatility of the APTC 9180 make it an ideal model-maker's lathe. Both are superbly accurate and have an extensive range of optional accessories to further enhance their capabilities. All in all, the Axminster metalworking lathes really are the only ones worthy of a second glance.



APTC 9180 Centre Lathe

APTC 460 Centre Lathe

DIARY DATE

The Axminster Tool &
Machinery Exhibition
14th - 16th November
Bath & West Showground
Shepton Mallet, Somerset

Ticket Hotline
01460 68686

PRICE (All prices include VAT @ 17.5%)

APTC 460 Lathe (Either Metric or Imperial)	£589.95
APTC 460 Slow Speed Attachment	£80.45
APTC 460 Fixed Steady	£40.50
APTC 460 Travelling Steady	£46.61
Carriage Paid (UK Mainland Only)	
APTC 9180 Lathe (Either Metric or Imperial)	£799.00
APTC 9180 Cabinet Stand & Raising Blocks	£169.26
APTC 9180 Fixed Steady	£34.63
APTC 9180 Travelling Steady	£28.52
APTC Delivery	£25.00

For additional accessories please see catalogue

Freephone Telesales
☎ 0800 371822
Facsimile
01297 35242
Technical Sales
☎ 01297 33656
E-mail Axminster@msn.com

For your free copy of our latest 400 page colour catalogue telephone now on
01297 34836

Telephone or fax NOW for our monthly Special Offer Newsletter containing our very latest offers on machinery and power tools

AXMINSTER
POWER TOOL CENTRE

Chard St · Axminster · Devon · EX13 5DZ